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Editorial Notes

Carbonizing Plant

THE Paper by Mr. F. B. Richards at the Institution meeting will prove of the utmost service to those in any way responsible for the choice of carbonizing plant. At the meeting it was agreed on all sides that it was a masterly contribution on a very wide subject; and the Author's treatment—the Paper was unique in being the first to be presented by a corporate member of the Institution engaged on the contracting side of the Industry—was frank and free from bias. Data resulting from the work of the Woodall-Duckham Companies were given generously for the benefit of the Industry. The more we study the Paper the more we appreciate how many helpful facts and how many carefully thought-out conclusions are contained within such short compass. It is quite free from "padding." One would, however, hardly expect "padding" in a contribution by one who, like Mr. Richards, has such a wealth of experience upon which to draw.

The Paper indicated some of the factors a plant designer must consider in the projecting and building of a modern carbonizing plant; and at the outset the Author, pointing to the different angles from which the gas engineer and the plant designer view coal carbonization, remarked that every individual project requires separate examination; generalizations are dangerous; what is right in one case may be wrong in another. And from his experience the plant designer is able to appreciate the importance of assessing rightly the effect of local factors when transplanting a process from one environment to another. As a matter of fact, during the discussion Sir Frederick West, commenting on the many variables which have to be taken into consideration in the choice of carbonizing plant, queried whether too much licence had been given in the matter of declared calorific value by the Gas Regulation Act of 1920. In his Paper at last year's Institution meeting Mr. E. G. Stewart mentioned that at that time 844 gas undertakings had selected 28 different calorific values—ranging from 200 to 600 B.Th.U.; yet over 90% of the gas sold in this country is of a calorific value between 450 and 500 B.Th.U., and he suggested that it would not seem out of place to expect that in the near future unlimited choice in calorific value would give place to a few standardized values throughout the country. At the meeting of the Institution this month Sir Frederick West expressed the opinion that an economic enquiry might well be instituted into the question.

To return to Mr. Richards' Paper, in the introduction the Author outlined the difficulties encountered by the plant designer in evolving improvements in plant, in transferring new ideas to the sphere of practical politics; and in this connexion—and his remarks were fully endorsed by Sir Frederick West—he recorded that the present high state of efficiency of modern carbonizing plant has only been made possible by the courage and foresight of those engineers and managers who have extended to the plant designer, in his effort to improve manufacturing methods, their co-operation, support, and tolerance. It is a fact that all must pull together to make a success of any new system of carbonization.

Choice of Calorific Value

MR. RICHARDS' Paper was not one which lent itself to criticism; and, in fact, it was not subject to criticism at the meeting. It, was, however, packed with sound advice, and we should like to touch for a moment on one or two of the points considered. First of all the part played by the calorific value of the gas required in the choice of carbonizing plant. With continuous vertical retorts, "over a wide range of calorific values the therms per retort per day remain constant for any particular coal irrespective of the calorific value of the gas being made." With intermittent vertical chambers, "the volume of gas made per chamber per day remains constant irrespective of calorific value. Consequently, as the calorific value of the gas is reduced by steaming, the therms made per chamber per day fall." It is the difference, of course, between continuous and periodic steaming. What appeals to us particularly in this section of the Paper dealing with the incidence of choice of calorific value is the influence on carbonizing plant of the methods adopted in removing hydrogen sulphide from the gas. And here again we quote from the Paper: "Too often it is found that an oxygen content of 0·9% is accepted in the gas leaving the purifiers. A reduction to 0·4% oxygen would result in an increase of 10 B.Th.U. in the calorific value of the gas. Under average conditions on continuous vertical retorts each 0·5% of unnecessary oxygen in the final gas means a loss of 2 therms per ton." This, presumably, by the reduction of steaming to maintain the calorific value.

Then, following considerations of the possibilities of providing for sudden changes in gas demand by arranging for the settings to be capable of partial or complete firing by means of coal gas—and many, we know, are toying with this idea, in spite of the fascination of complete gasification—we have Mr. Richards' comments on Pexton's Yardstick. We

have had a good deal to say about Pexton's index of assessment—the Hydrocarbon Enrichment Value—which to our mind strikes at the roots of gas making practice. In this regard Mr. Richards said that "H.E.V." "seems to meet the need more nearly than any other formula yet proposed. The value of this method is that it expresses the result as a single number, irrespective of the calorific value of the gas being made." But, "a high H.E.V. figure is not necessarily synonymous with a cheap therm." This statement brings us back to the problem as to what declared calorific value has the best chance of producing the cheap therm, to the contention of Sir Frederick West that an economic enquiry might well be instituted into the diversity of calorific value declarations which prevail.

Laboratory Investigations

We will pass over lightly the section of Mr. Richards' Paper dealing with laboratory investigations of coal and coke. Sir Frederick West, during the discussion, suggested that the Author was slightly optimistic about the value of small-scale assay tests. The apparatus in the Woodall-Duckham Laboratories, however, seems to us a remarkable advance in small-scale technique, incorporating an extreme nicety of heat control. Of course, laboratory-scale work has its limitations and the findings demand faultless interpretation. From the viewpoint of the user and designer of carbonizing plant large-scale tests are to be preferred, but obviously such tests necessitate the treatment of a considerable quantity of coal, and this is not always feasible. The tube test apparatus described by Mr. Richards requires for each test only 20 grammes of coal, and the results can be correlated with large-scale yields.

Mr. Richards discussed the nature of ash as affecting producer operation and retort life, pointing out that the importance of ash is especially evident when steaming is practised, since the ash is then liberated in considerable quantity, and if it is reactive in nature and has a low melting point attack of the retort walls is liable to occur. In the producer the presence of fused ash increases the labour of cleaning the fires and leads to attack of the producer walls; and, depending on its fusibility, any fuel ash carried into the setting by the producer gas will be present in the combustion flues either as a sintered mass or as a liquid slag. In this connexion we would call attention to the remarks of Mr. E. G. Stewart in the discussion on the Paper by Mr. W. Hawkyard at the meeting. Mr. Stewart, commenting on the use of breeze in producers, spoke of the difficulties which result from dust finding its way into flues. "The absence of economy from the use of this small, dusty fuel for retort heating," he said, "is one that has to be learnt by experience."

Cost of Gas Production

On the subject of cost of gas production Mr. Richards set out some very interesting parity values, observing that 25% more fuel into the producer, 75% more labour on the carbonizing plant, 25% more capital expended, 0·66d. per gallon of tar made—each of these factors has approximately the same quantitative effect on the cost of gas production when making 500 B.Th.U. gas in continuous vertical retorts and intermittent vertical chambers. "A high return for coke in comparison with the cost of coal," he remarked, "is to-day the most certain road to the cheap therm." We think that money spent in processing coke, in "up-grading" the products, is money well spent. Mr. Richards mentioned, too, that a high thermal yield of gas per ton of coal does not necessarily represent the lowest cost per therm—a point we have stressed many times in these columns. He also called attention to the need for carefully considering works steam requirements when designing a carbonizing plant. In many cases a therm of steam produced by direct firing costs as much to make as a therm of gas.

Finally, the section of the Paper dealing with recuperative and non-recuperative settings and regenerative settings interested us very much indeed. In this connexion Table 4 of the Paper was very informative. This table showed that, allowing for only a moderate consumption of steam on the works, the total fuel bill is greater with the regenerative settings than with the non-recuperative settings. With the example given, on an installation with a capacity of 400 tons of coal per day, working 300 days per annum, the total annual sum in favour of the non-recuperative scheme is over £6,500. The Author concluded that "the procedure generally employed in British gas-works of heating settings by hot producer gas, coupled with waste heat recovery in the form of steam, leads under British conditions to a lower cost per therm of gas made, in spite of the shorter life of the settings caused thereby."

Order or Chaos?

In the belief that the present and prospective coke market situation indicates an urgent need for a co-ordinated policy of commercial development we commissioned an independent investigation by one who is neither technically nor commercially interested in the coal carbonizing industries. The outcome of the investigation has been the publication of a series of three articles in the "Journal," the last of the series appearing in the "Journal" last week. The interests of producers, distributors, and consumers have been given full weight; and it will, we think, be useful if we point to some of the main findings and proposals resulting from this impartial enquiry.

In the first article of the series the statistical position was examined; and it was mentioned that in the four years 1934-37 new ovens to carbonize 17,725 tons of coal per day were built at steel works and 664 ovens with a capacity of 9,773 tons of coal a day were installed at collieries. Formerly the coke oven industry catered almost exclusively for the demands of the iron and steel works. It is now being split into two sections, the colliery oven section which is being driven into the general market, and the steel works section where the coke produced in the ovens is absorbed in the steel making process. The gas industry has cultivated a domestic and general industrial market for every ton of coke it can produce, but it is obvious that more and more oven coke will find its way into the markets developed by the gas industry. Production of coke from all sources indicates a surplus this year over current market demands of something in the neighbourhood of 4 million tons, increasing to 7 million tons next year, even if the steel works continue to take as much as they are consuming at present. There is obviously a problem to be faced, an urgent problem, if order instead of chaos is to prevail in the coke market. We are at the cross-roads of coke marketing to-day, and if the situation is allowed to drift it will rapidly become serious. If, however, it is properly taken in hand we find no cause for gloom. It may be that in the future solid fuel will be displaced entirely by gas. The gas industry looks forward to that time and is actively engaged on research to that end. In the meantime there is an enormous amount of raw coal that should be and could be

replaced by gas and coke; and provided the domestic market is properly developed there is no reason why it should not absorb all the surplus from the coke ovens at reasonable prices. Thanks to the efforts of the gas industry in recent years in building up the coke market, the demand has largely increased. Last year about 850,000 tons more gas coke was sold than in 1936, yet in many instances the supply was not equal to the demand.

The problem is so to regulate the market that, while there is an expanding demand, there shall be no undue depression of prices and no flooding of one section of the market at the expense of another; and it is quite clear that unless co-ordination is promptly established coke selling is likely to drift back to cut prices, little or no profit, and instability of trading. Coke oven owners cannot want to see such a state of affairs, and the gas industry is naturally anxious that the results of its efforts shall not be dissipated. That the coke oven industry stands to gain more from development work in the future than does the gas industry is shown by the fact that gas-works do not normally produce more than about 300,000 tons of additional coke each year throughout the country, which is less than half that required for new domestic appliances alone. As our investigator remarks in the second article, "the rest of the requirements must be met from the coke ovens, and it is anomalous that they should benefit from the work of the gas industry without having a share in financing and extending it." And he went on to say that the gas industry, except perhaps in a few isolated cases in the north, has extended a hand of friendship to the coking industry with a view to combined action.

Solution of the Problem

WHICH brought our investigator, in the third article, to suggestions as to the solution of the problem. The obvious course, he urged, is for gas and oven coke producers, merchants, and distributors to organize themselves for the purposes of creating and regulating the coke market throughout the country. Co-operative action must not be confined to mere price stabilization. Steps must be taken to ensure that coke quality is right and that the consumer gets the coke of appropriate quality and grade for his needs, and development work on new uses for coke and improvement of coke burning appliances, both domestic and industrial, must be pursued. The London and Counties Coke Association has shown what can be accomplished in this direction. Now the ideal, concluded our investigator, would be the establishment of some six or seven regional coke associations in England and Southern Scotland fashioned somewhat on the lines of the London and Counties Coke Association but embracing the producers of oven coke as well as gas coke, with a national confederation of associations which could speak with a national voice on matters of major policy and co-ordinate the supply and demand in various parts of the country. The coking industry must, as a whole and not merely by units, recognize that in co-ordination lies its only hope of levelling out the slumps and the booms. We have gone some way towards this desirable end. An organization similar to the L.C.C.A. has been established in the Midlands and there is a somewhat similar organization in operation in the North-East coast area, the only region so far that has brought gas and coke oven producers into common membership. In the Yorkshire area 80% of the coking industry have formed themselves into a Coke Producers' Federation; Yorkshire and Durham have a Coke Co-ordination Committee; and Nottinghamshire and Derbyshire have formed themselves into an association. Oven coke producers would be welcomed into membership of the associations already formed by the gas industry and for a comparatively small subscription they would share the benefits of an already established market, price stabilization, and constantly growing research and propaganda. Only the fringe of possible markets for coke has yet been touched.

Each local association, it was suggested, should be large enough to form a strong negotiating body and geographically situated to regulate and control the coke market in its area, leading up to a national body, for there are issues which can only be settled satisfactorily when the industry can speak with a united national voice. If co-operation were achieved only in a series of self-contained, watertight areas it would be quite possible for one area to suffer at the expense of another, whereas a national policy, while not imposing irksome regulations, would ensure a reasonable measure of uniformity and would deal with such possibilities as abnormal industrial developments in unlikely areas requiring abnormal "imports" of coke supplies from other parts of the country. And the alternative to co-ordination? "Chaos, cut prices, depressed industry, and ultimately control by statute."

For years now we have advocated co-operation between the gas industry and the coke oven industry in the marketing of coke, and we feel that in commissioning this searching and independent investigation into the present situation a useful purpose has been served. In the series of articles the present position is stated clearly and a solution of problems which, without co-operation, are bound to arise is set out. When those directly concerned with the everyday problems of the market have perceived the advantages of the proposed new partnership, it should not be long before steps are taken to place it on a national basis.

W-D Becker Ovens at Waleswood

With members of the Coke Oven Managers' Association, we inspected the new W-D Becker by-product coking plant at Waleswood on the kind invitation of the Directors of the Waleswood Coking Company and the Woodall-Duckham Vertical Retort and Oven Construction Co. (1920), Ltd., on Thursday last. The highly successful manner in which the problems presented in the planning of the installation have been overcome received the universal approbation of the visitors. In the first place it was necessary to design the new plant so that the existing installation could be worked without interruption while the new plant was being built and put into operation. This restricted somewhat the choice and extent of the site and made it necessary to adopt one which had certain disadvantages. A considerable amount of existing plant had first to be dismantled and, furthermore, excavations for foundation work revealed the presence of a local deposit of carbonaceous shale. The deposit was too extensive for removal on economic grounds, and special measures had to be taken to safeguard the foundations. A short oven has been adopted in view of the site restrictions and the amount of coal available for carbonization. In other respects the ovens conform to dimensions and principles of design normally found in modern coking installations. In this way the benefits offered by the modern type of unit have been fully retained, and space has been saved where most required, wasteful load factors have been avoided, and a sufficient number of units provided to permit of flexibility of working. The ovens themselves are of the cross regenerative type, and, when working on a coking schedule of nineteen hours, are capable of carbonizing 1,870 tons of coal per week. The ovens are heated by means of coke oven gas, and are the first W-D Becker ovens to incorporate the Underjet principle. Far

from being taken as an indication that the Woodall-Duckham Companies have become wedded to the Underjet principle, this move should be interpreted rather as an earnest of their willingness to design complete coking installations best suited to the needs of the buyer.

Coal Prices Enquiry

In the House of Commons last week the Secretary of Mines was asked if he could announce the personnel of the Committee to consider the prices charged for coal to the general and domestic consumer. Captain Crookshank replied that Sir Walter Monckton, K.C., had accepted the Chairmanship of the Committee, the terms of reference of which were "To enquire into the organization and methods of distribution of coal, coke, and manufacturing fuel; to investigate the various items which make up the differences between the prices received by the producers and those paid by the consumers, and to make recommendations." Sir Walter Monckton, who recently represented the Sheffield Gas Company during the hearing before the House of Lords Committee of the proposed West Yorkshire Gas Distribution Bill, was called to the Bar in 1919. Other members of the Committee are Professor J. H. Clapham, C.B.E., Professor of Economic History at Cambridge University and formerly Professor of Economics at Leeds University (during the War he held appointments at the Board of Trade); Sir Herbert Hiles, M.B.E., J.P., who was Lord Mayor of Cardiff in 1936-37; Mr. H. Lancelot H. Hill, M.A., F.C.A., Senior Partner in Hill, Wellacott & Co., Chartered Accountants, who also held appointments at the Board of Trade during the War, was President of the Institute of Chartered Accountants in 1931-32 and 1933-34, and an Assessor under the Midland (Amalgamated) District (Coal Mines) Scheme, 1932; Sir John Lorne MacLeod, G.C.E., LL.D., Chairman of the Scottish Life Assurance Company, who was Edinburgh City Treasurer from 1916 to 1919 and was appointed Food Commissioner for Scotland in 1920; Major E. G. Monro, O.B.E., of George Monro & Co., Ltd.; and Miss E. T. Kelly, Warden of St. Margaret's House, Bethnal Green.

British Standards Institution

Proposing the toast of the British Standards Institution at the Institution's annual luncheon at the Dorchester Hotel last week, Mr. Ronald Cross, M.P., the recently appointed Parliamentary Secretary to the Board of Trade, said that the importance of the work done by the Institution was not limited to this country, but was increasingly recognized throughout the world. The Institution has applied to the Government for an increased grant on account of the growth in its activities, but Mr. Cross was not wholly encouraging in discussing this. There were many interets, he said, which desired financial help, and while he could not bring any tidings of what the Government's intentions might be, he could only say that if the hopes of the Institution were not entirely fulfilled he would have to join hands in saying that the Treasury were "tight-fisted." Dr. E. F. Armstrong, the retiring President, who responded, remarked that increased accommodation at the Institution's headquarters was urgently needed, and, indicating the extent to which its work has developed, he mentioned that there are now 950 Committees the membership of which numbers 18,500. Other speakers at the luncheon were Sir Frank Heath, the new Chairman of the Institution, and Lord Dudley Gordon, President of the British Engineers' Association, who commented on the increasing tendency for competitive manufacturers to meet for the discussion of common interests. As far as our Industry is concerned, the Gas Industry Section of the B.S.I. has been placed in a more satisfactory financial position since contributions from the national bodies are now on a basis comparable with those of organizations in other industries, and, in addition, many individual gas undertakings and manufacturers of plant and equipment are contributing members of the Section.

Security in Gas

The slide in prices of stocks and shares enables investors today to secure a more satisfactory return on good-class industrials than was the case twelve months ago, but even so the advantages of the Gas Industry as a medium for investment continue to stand out. Not only are yields attractive, but there is the added advantage of stable dividend records. There also attaches to investment in the Gas Industry that peace of mind which only unquestionable security can give. Some days ago a writer in the *Financial Times* showed reasoned appreciation of the advantages of the Gas Industry to investors who may desire to sleep soundly o' nights. He compiled a table showing the attractive yields offered on shares of leading companies, and added that in nearly all cases the dividend records are remarkably consistent, showing little or no variation even during the depression years. The acknowledgment of this writer that "progressive sales methods, co-operation, and enterprise have brought striking results in recent years" is welcome in face of the criticism one sometimes encounters. The author of the article has little doubt that the next few years will witness a considerable further extension in the holding company movement, and it is his opinion that these holding companies "have considerable potentialities for benefiting the gas consumer through a reduction in price and, provided capital inflation is avoided, the shareholder through an increase in dividend." In the table already referred to, two of these holding companies are included—the South-Eastern Gas Corporation and the United Kingdom Gas Corporation, the largest and second largest respectively of the series. Figures relating to these two Corporations are given in the article, showing 24 undertakings controlled by the former and 40 by the latter, who also control the Caledonian Gas Corporation owning 18 undertakings in Scotland. The writer is on safe ground in claiming that the Gas Industry is a leader among British industries, and we would support what he has advanced as to the attractiveness of gas as an investment by remarking that the investor—and particularly the small investor, to whom safety of capital is of paramount importance—may easily go farther and fare very much worse.

Letter to the Editor

Insidious Electrical Propaganda

SIR,—In your issues of May 25 and June 1 respectively you published reports of question and answer in the Northern Ireland House of Commons, and an Installation Speech by the Mayor of Bangor (Co. Down), containing references to my book, "The Cause of Cancer."

Mr. E. Warnock, K.C. (U. St. Anne's, Belfast), asked whether the Minister of Commerce had seen the statements emanating from the Imperial Cancer Research Department which described the book as "a tissue of errors and not worth reading." I would inform you that as a result of my writing to the Imperial Cancer Research Fund, I have received an official letter from Dr. W. E. Gye, Director of the Fund, to say that the latter have never expressed such an opinion and would not think of doing so. In addition, he emphasizes that any personal opinion he may have given as an individual is not connected with the Fund, of which he is a Director, and at the same time he states that he has not authorized publication of this personal opinion.

As you have reported this episode in the Northern Ireland Parliament, which was referred to also in the speech of the Mayor of Bangor, I shall be glad if you will kindly publish this letter for the information of your readers.

Yours, &c.,

DAVID BROWNLIE.

56, *Grange Road, W.* 5,
June 17, 1938.

Amalgamation and Grouping

A.G.W.U., Ltd., and Taunton.

We are advised that Associated Gas and Water Undertakings, Ltd., have acquired a majority interest in the Taunton and District Gas Company.

Gas Consolidation and Cheadle.

The Cheadle (Staffs) Rural District Council have approved the draft agreement for the sale of their Gas Underaking to Gas Consolidation, Ltd.

Personal

The staff of the Buckie Gas Light Company made Mr. W. C. CAMPBELL, Engineer and Manager, a presentation on his leaving Buckie to take on similar responsibilities at Galashiels.

* * *

Mr. THOMAS EDWARD BEELEY has been appointed Chief Assistant at the County Borough of St. Helens Corporation Gas Undertaking. He entered the service of the Corporation in 1904. On the retirement of the Gas Engineer, Mr. Glover, in 1922, he was appointed Works Superintendent, and he has now been promoted to the position of Chief Assistant. Mr. Beeley is an Associate Member of The Institution of Gas Engineers.

* * *

The wedding took place on June 14 at Christ Church, Weston-super-Mare, of Miss Margaret Thomas, elder daughter of Mr. and Mrs. F. Thomas, and Mr. JAMES BUCKLEY TAYLOR, of the Bristol Gas Company. The bridegroom is the son of Mr. James Taylor, Chief Engineer and Manager of the Weston-super-Mare and District Gas Company.

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Mr. G. W. PERKS, Chief Chemist at the Stockton Corporation Gas Department, has been appointed Deputy Manager.

* * *

Mr. GEORGE EDWARD SHEARMAN, Engineer and Manager of the Heckington Gas Company, was married at St. James' Church, Woodhouse, Sheffield, to Miss Mary Elizabeth Barlow, of Woodhouse Mill, on June 8.

* * *

Mr. D. J. COLVIN, Engineer, Manager, and Secretary of the Oswaldtwistle Gas Department since 1931, has been appointed Engineer and Manager of the Littleborough Gas Company. A London man by birth, Mr. Colvin has had experience in Cornwall, Blackburn, and Nelson before going to Oswaldtwistle.

* * *

At a meeting of the Directors of the Wakefield Gaslight Company, held on June 16, Mr. A. M. LAWRENCE was appointed Chairman in the place of the late Mr. G. A. Moorhouse, J.P., and Mr. A. E. GREAVES, J.P., succeeded Mr. Lawrence as Vice-Chairman. Mr. Lawrence joined the Board in 1905 and has been Vice-Chairman since 1914. Mr. Greaves came to the Board in 1923. Mr. C. W. WARD, A.M.Inst.C.E., Engineer and General Manager of the Company, was elected a Director to fill the vacancy caused by the death of Mr. Moorhouse.

Obituary

W. E. Price

An Appreciation

William Edward Price has crossed those dark waters over which all must pass and from which there is no return. His many friends, whether within or outside the Gas Industry, mourn the loss of a great man. His greatness was not measured by his stature, but by his knowledge of men and affairs, and by the sympathetic consideration and practical assistance which he always gave whenever he could find occasion so to do. The presence, in addition to relatives, at his graveside on Wednesday, June 15, of many friends, including workpeople with whom he had been closely associated, was an eloquent testimony of the respect in which he was held by everyone.

Those connected with the Gas Industry will ever remember the number of rôles he so ably filled. Many who recall the years when he was President, and later Honorary Secretary, of the Southern Association of Gas Engineers and Managers, will always bear in mind how he responded to the calls of the duties of those offices. From 1913 to 1936 he was Honorary Secretary of The Institution of Gas Engineers, and although the vast majority of members did recognize that his whole heart and soul was in the service of the Institution, only those who have constituted the Council from time to time can possibly be aware of his great value. He was a true counsellor and friend. His foresight was remarkable, and he was ever ready to forebear. His ability to calm troubled waters was beyond wonder. His unselfishness and kindly thought for others were clearly demonstrated when he retired from the Honorary Secretaryship of the Institution, for it was at his wish a very large amount of the sum subscribed as a testimonial was handed over to the Benevolent Fund—an action typical of his generous heart.

To those of us who knew him so intimately as to refer to him as "Willie Price" or "Uncle Price," his passing is felt most acutely, but we are grateful beyond measure to appreciate that, although he had passed the allotted span of three score years and ten, he played his part and retained his interest in all persons, matters, and bodies connected with the Industry to which he was devoted and for which he worked so faithfully with unqualified success.

His twinkling eyes and genial smile will be seen no more. They are, and will continue to be, fragrant memories in a world of haste torn by jealousies and fears.

C. VALON BENNETT.

* * *

In our account of the career of the late Professor W. A. BONE in the "JOURNAL" last week we stated that in 1906 he was selected as the first occupant of the Livesey Chair of Fuel and Coal Gas Industries at Leeds University. Actually the year was 1910.

* * *

The death occurred suddenly on June 10 of Mr. WILLIAM SCOTT, Chief Analytical Chemist, Tradeston Station, Glasgow Corporation Gas Department.

Mr. Scott commenced his career with the Corporation at Tradeston in 1911. After the war he returned to Tradeston, ultimately becoming Chief Analytical Chemist there. He was an enthusiastic member of the Western District of the Scottish Junior Gas Association. Mr. Scott was 41 years of age and leaves a widow and young family.

* * *

The death occurred at Swindon, on Tuesday of last week, after a short illness, of Mr. ALFRED CHATWIN, who was for 46 years on the staff of the Swindon United Gas Company—for many years as chief cashier.

Forthcoming Engagements

June

23.—B.G.F.—Visit to Empire Exhibition, Glasgow.

24.—Southern Association.—Summer Meeting at Lea Bridge.

25.—London and Southern Juniors.—Summer Visit to Folkestone.

27.—I.G.E.—Sub-Committee on Unaccounted-for Gas, 2.30 p.m.

28.—I.G.E.—Gas Education Executive Committee, 11 a.m.; Gas Education Conference, 2.30 p.m.

29.—I.G.E.—Board of Examiners, 9.30 a.m.; Oral Examinations, 10 a.m.; Board of Examiners, 2 p.m. [*Times subject to confirmation.*]

30.—Southern Association (Eastern District).—County Meeting at Croydon.

30.—I.G.E.—Joint Committee on Complete Gasification under Pressure, 2.30 p.m.

[*No meeting of the Central Executive Board of the National Gas Council will be held in June.*]

July.

4.—I.G.E.—Research Executive Committee, 2.30 p.m.

5.—B.C.G.A.—Executive Committee, 11 a.m.; General Committee, 2.30 p.m.

5.—I.G.E.—Joint Lighting Committee, 2.15 p.m.

11.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.

12.—I.G.E.—Council, 10 a.m.

19.—I.G.E.—Gas Education Executive Committee, 11 a.m.; Gas Education Committee, 2.30 p.m.

19.—S.B.G.I.—Council Meeting, 56, Victoria Street, 2.30 p.m.

22.—I.G.E.—Joint Research Committee, 2.30 p.m. (*Transferred from June* 24.)

22.—I.G.E.—Liquor Effluents and Ammonia Committee, 11.15 a.m.; Joint Research Committee, 2.30 p.m. (*Tranfserred from June* 24.)

August.

9, 10, and 11.—Irish Association of Gas Managers.—Annual Meeting in Dublin.

News of the Week

Application for a Special Order, under the Gas Undertakings Acts, 1920 to 1934, is intended to be made to the Board of Trade by the Chelmsford Gas Department with the object *inter alia* of making further provision as to gas charges.

A Long Service Record which is perhaps hard to beat is that of Mr. William Eva, who has worked as a carter for the Falmouth Gas Company for practically sixty-five years without a break. He is greatly attached to his horse, and like many other old carters entertains a strong dislike to motor vehicles.

Over 8,000 Selected Consumers of the Newcastle-upon-Tyne and Gateshead Gas Company have received a colourful sales letter drawing attention to the undoubted advantages of the gas-operated refrigerator, both as regards the maintenance of health and the provision of iced delicacies and really cooling drinks.

The Transfer of the Gas Undertaking from the Glastonbury Corporation to a Company to be known as the Glastonbury and District Gas Company, Ltd., and controlled by the South-Western Gas and Water Corporation, is foreshadowed in an application to the Board of Trade for a Special Order under the Gas Undertakings Acts, 1920 to 1934.

An Extension of the Limits of Supply is among the provisions of a Special Order for which the Cardiff Gas Light and Coke Company intend to apply to the Board of Trade under the Gas Undertakings Acts, 1920 to 1934. The proposed added limits include the Parishes of Marshfield and Peterstone Wentloog in the Rural District of Magor and St. Mellons, together with a portion of the Parish of Michaelstone-y-Vedw.

An "Ascot" Water Heater Competition organized by the Cambridge University and Town Gas Light Company required entrants to state in order of preference the various advantages of an "Ascot." The prizewinners, who had contributed some original entries, received their awards—in the form of "Ascot" heaters—at a ceremony in the Company's Sidney Street showrooms on June 15. Mr. G. E. H. Keillor (Sales Manager) made the presentations, and Mr. Franklin, a representative of Ascot Water Heaters, Ltd., conveyed congratulations to the promoters of the competition upon its success. The Cambridge Company have recently decided to service Ascots, which are privately owned by householders, free of charge every three months.

New Gas Showrooms are to be built in High Street, Falkirk, at an estimated cost of £10,000, plans for which have been approved. In addition to extensive showrooms on the ground floor, there will be a demonstration hall, with a small stage, on the first floor. The hall will be seated to accommodate 150 persons. There is also included in the plans a cinema projection room.

Expenditure of £134,000 is contemplated by the Gas Committee of Glasgow Corporation for the construction of a large gasholder of the waterless type to serve the south-western areas of the city. The Committee on June 15 decided to recommend acceptance of the tender submitted by Messrs. Robert Dempster & Co., Ltd., Elland, Yorkshire. The holder will have a storage capacity of 8 million cu.ft.

The Installation of Automatic Lighters in the street lamps of Bourne have we learn, been the means of saving some 600,000 cu.ft. of unaccounted gas, and have been chiefly instrumental in reducing the figure from over a million cu.ft. to just over 352,000 cu.ft., or 1·56% of the total amount of gas made. In addition to accounting for that large amount, the lighters have meant a saving of £50 in wages, and actually, while a smaller amount of gas has been made, some 140,000 cu.ft. more has been sold.

At the Horse Show and Parade promoted by the Royal Society for Prevention of Cruelty to Animals held at Leamington on June 18, in the class for "Heavy Draught Horses the Property of Railway Companies, Brewers, Builders and other heavy trades" all four awards—namely, 1st, 2nd, and 3rd prizes, and the Certificate of Merit went to horses belonging to the Leamington Priors Gas Company. The Company's drivers take great interest in their horses and are usually successful at these Parades.

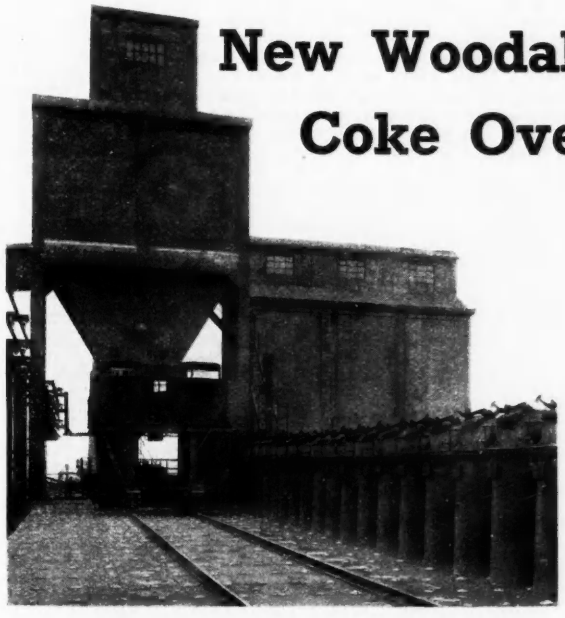
A Useful Booklet dealing comprehensively with Gas Consolidation, Ltd., Severn Valley Gas Corporation, Ltd., and their Controlled Companies has recently been published, and we are indebted to Gas Consolidation, Ltd., for the receipt of a copy. The statistics which appear in the booklet are based on the last published accounts. The names of Directors, auditors, and officers and a host of useful figures relating to capital, output, and charges are among the many items covered. The disposition of the Controlled Companies is clear from a map which is included.

Gas at the Three Counties Show

Our photograph gives an idea of the comprehensive gas exhibit which was staged recently at the Three Counties Show held at Gloucester. It will be seen that travelling showrooms play an important part in such exhibitions. The Show was visited on the second day by the Duke of Gloucester.

New Woodall-Duckham Coke Oven Plant at Waleswood

By kind invitation of the Directors of the Waleswood Coking Company, Ltd., and the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., members of the Coke Oven Managers' Association were privileged to inspect on June 16 the W-D Becker Ovens and By-Product Recovery Equipment forming the new plant of the Waleswood Company. Many interesting features are incorporated in the plant, the surplus gas from which is being delivered to the Sheffield Gas Company's Grid and the South Yorkshire Gas Company.



Battery Top, showing Existing Main Coal Bunker, Ovens Service Bunker, Charging Car, and Ascension Pipes.

The planning of the new by-product coking installation of the Waleswood Coking Company presented a number of problems. In the first place it was necessary to design it so that the existing plant could be worked without interruption while the new installation was being built and put into operation. This restricted somewhat the choice and extent of the site and made it necessary to adopt one which had certain disadvantages. A considerable amount of existing plant had first to be dismantled and, furthermore, excavations for foundation work revealed the presence of a local deposit of carbonaceous shale on one part of the available site at about 25 ft. below the existing ground level. This deposit was too extensive for its removal to be an economical proposition and special measures had to be taken to safeguard the foundations of the oven battery.

In view of the restricted site and the relatively small amount of coal available for carbonization it was decided to adopt a short oven, which in other respects conformed to the dimensions and principles of design normally met with in modern coking installations. In this way the benefits offered by the modern type of unit could be fully retained, while space could be saved where most required, the use of large oven machinery operating on a wasteful load factor could be avoided, and a sufficient number of units could be provided to permit considerable flexibility of working. Careful attention was paid to the possibilities of re-using as much of the existing equipment as was compatible with securing a thoroughly efficient installation. The existing coal washery was retained, together with the coal conveyor and the main ovens storage bunker, a simple conveying and elevating system having been devised for transferring coal from the existing bunker to the service bunker for the new battery. In addition, the existing coke car, provided with a new system of rope haulage, is still employed and delivers its charge to the existing wharf.

The by-product and benzole plant is entirely new, with the exception of two scrubbers, an oil cooler, and various storage tanks. The adaptation of existing apparatus in this section made it necessary to close down the old benzole plant for a short period prior to the starting-up of the new plant, but in all other respects the old coking and by-product plant was kept continuously at work during the change-over period. In fact, it was found possible, during several weeks forming the later stages of this period, to recover the by-products and benzole from the gas made in both coking plants, using only the new by-product plant: the old battery was at this time under partial load, the new battery being at full output.

Smoothness of working during the critical change-over period was achieved only by careful planning and by perfect co-operation between the officials of the Waleswood Coking Company and the Woodall-Duckham Company's engineers.

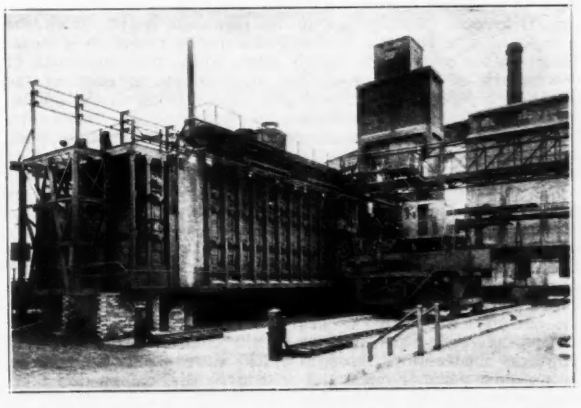
Work at the site commenced in October, 1936, and, in spite of the difficulties experienced with the foundations and the extensive additional work involved in meeting them, the first oven was pushed twelve months later, within the specified period. This can be regarded as particularly satisfactory, at a time when great difficulties were generally experienced in obtaining prompt deliveries of materials.

The installation comprises a fully equipped battery of 23 W-D Becker coke ovens and plant for the recovery of crude tar, concentrated ammonia liquor, and crude benzole. The Waleswood Coking Company was responsible for the design and erection of the exhauster house, the detarrer generator house, and a new office and laboratory building. All the electric power and lighting arrangements were also carried out by the Company's own electrical staff.

General Description.

Washed coal for the ovens is brought from the washery to an existing bunker adjacent to the new battery. The coal stored therein is delivered by a system of belts and a bucket elevator to a new ovens coal storage bunker, the two bunkers together affording accommodation for 650 tons of coal.

The ovens are of the W-D Becker cross regenerative type and, when working on a coking schedule of 19 hours, are capable of carbonizing 1,870 tons of coal per week. They are heated by means of coke oven gas on the Underjet principle. The new oven machines comprise a coal charging car, a combined pushing, levelling, and door extracting machine, and a combined coke side door extractor and coke guide. It was found possible to make use of an existing coke car which served the old ovens. The



Pusher Side of Battery, showing Pusher Machine, Suction Main, New Ovens Service Bunker, and Existing Coal Storage Bunker.

pusher machine and coke side door extractor carry clay for luting the doors. The coke is at present quenched by open sprays, but the Waleswood Coking Company is now erecting a new brick-towered quenching station. The coke car is hauled to the quenching station by a rope haulage system, which, after the quench,

serves also to haul the car to an existing screening wharf, where the small coke and breeze is separated from the large coke, both classes of material falling into waggons located on parallel tracks.

The by-product recovery plant is of the indirect type with equipment for the recovery of crude tar and concentrated ammonia liquor. Plant is installed for the recovery of crude benzole; it was found possible to incorporate certain of the existing apparatus in this section. After leaving the benzole scrubbers the gas stream is divided; a portion goes back to the ovens for use as fuel; of the surplus the greater proportion is supplied to the Sheffield Gas Company, the remainder being purified on the site and boosted into the local supply mains.

The Oven Battery.

The 23 ovens are arranged in a single battery with the ovens bunker at one end. They are of the W-D Becker regenerative Underjet type, each being 23 ft. 8½ in. long and 12 ft. 6 in. high, having an average width of 18 in. The holding capacity of each oven is 408 cu.ft. and, when operating on a 19-hour coking schedule, the battery is capable of carbonizing daily 267 tons of coal containing 12% moisture. The oven brickwork is constructed of first quality silica from the pad upwards, excepting only the filling in the regenerators, the oven soles, and the end walls adjacent to the pinion walls. The oven jambs, regenerator facings, and oven tops are insulated, the latter having a finish of paving bricks. In order to accommodate and give ready access to the Underjet firing arrangements, the battery structure is supported on reinforced concrete columns, at the base of which a concrete floor is provided. Substantial pinion walls are provided at each end of the battery and are supported independently of the concrete mat.

A concrete waste gas flue, lined with firebrick, is built along the coke side of the battery, leading to the stack, which is placed at the end of the battery away from the bunker. The stack is 175 ft. high and is firebrick-lined for the first 70 ft. above the waste gas flue inlet. An interesting feature is the fact that the waste gas flue is housed in a concrete trench and carried on stilts to insulate it from the deposit of shale mentioned earlier, which might otherwise be a source of danger due to the conduction to it of the heat in the flue. The foundations of the chimney are also, for the same reason, arranged at a higher level than is normal, the waste gas flue being sloped up at this end at an angle of about 30° to enter the chimney above ground, thus providing ample air circulation round the waste gas flue throughout its length.

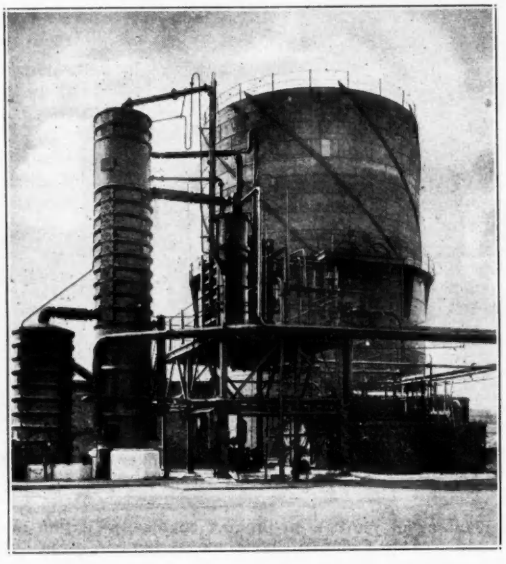
Heating System.

The heating system of the W-D Becker oven consists of a series of vertical flues on each side of each oven, with two regenerators, filled with chequer brick, under each series of vertical flues. Coke oven gas being employed as the heating medium, both regenerators are used for preheating the air for combustion.

In the present instance, the ovens being of the Underjet type, the coke oven gas is distributed to the heating flues by means of a pipe running in the basement below each pair of regenerators, this pipe serving to feed the individual heating flues by way of vertical ducts formed in the wall between the two regenerators. Each vertical duct is provided with a device which enables the gas supply to each heating flue to be regulated readily from the basement. The fuel gas is also preheated by means of a steam heater before entering the supply main, which runs the length of the battery in the basement and supplies gas to each of the distributing pipes. The air and gas come together at the bottom of each vertical flue with streamline effect, and the combustion zone is evenly distributed throughout the height of these flues. The products of combustion are then collected from the top of each group of three or four vertical flues and are carried over the top of the oven by means of cross-over flues. There are six cross-over flues over each alternate oven, none being required for the intermediate ovens. From these flues the waste gases are distributed into an equivalent number of vertical flues on the other side of the oven, exactly opposite the flues up which they have travelled. They then travel down these flues and into the two regenerators immediately below, through which they pass to the waste gas flue, giving up heat to the chequer filling in transit.

Upon reversal, which is automatically controlled, the air travels up those regenerators through which waste gas has previously passed and, when it meets the coke oven gas, combustion takes place upwards; the products of combustion travel through the cross-over flues, and down the flues up which the burning gas has previously travelled, finally passing out through the corresponding regenerators. This arrangement of heating ensures that the travel of gases throughout the system is short and, as the gas flow on either side of the walls of the vertical ducts is in the same direction, there is a low pressure differential and an absence of leakage.

Although, as in other types of ovens, more gas is applied to the wider end than the narrower, in order to carbonize the varying width of coal charge in the shortest time, a very high efficiency of regeneration is obtained in the Becker system, because the quantity of air at any point in the length of the oven takes up from the regenerator brickwork the heat which has been given to it by the waste gases from an equivalent quantity of air and gas mixture. The air and waste gas reversing valves are accommodated in an alley-way beneath the coke side platform. Communicating by a doorway with this alley-way is the battery control room, in which are situated the reversing machine and instruments. The reversing machine is actuated by an electric motor controlled by an electric clock, which can be set to operate the machine at various time intervals. An emergency push button control is provided, and, should the clock fail to operate the machine at the predetermined time, an automatic time switch sounds an alarm. On a well-designed instrument panel in this room are mounted the instruments for control of the battery.



Ammonia Concentrating Plant, showing (left to right) Fixed Still, Free Still with Decarbonating Trays at top, Catch Tower with Coolers and Heat Exchangers behind, Automatic Steam and Liquor Control, and Running and Storage Tanks. The Gasholder (in background) is fitted with Automatic Controls to the Surplus and Bleeder Mains.

Gas Collecting System.

The crude gas leaves the ovens through ascension pipes at the pusher side and passes into a steel collecting main. One ascension pipe, lined with special insulating material, is provided for each oven and each pipe is fitted with a spray for liquor flushing. Sprays are also provided in the main at alternate ovens. The collecting main is equipped at each end with a liquor-sealed bleeder. From the collecting main the gas and liquor pass through a cast-steel offtake into a suction main supported on a steel bridge over the pusher track. The main terminates at a downcomer before the primary coolers. The flushing liquor, which runs in a closed circuit, is returned at the downcomer to a liquor flushing and separating tank of approximately 13,000 gallons capacity. Two centrifugal liquor flushing pumps are provided, one electrically driven and one steam turbine driven; each has a capacity of 15,000 gallons per hour and the turbine-driven pump is a standby. Suspended matter in the liquor leaving the pumps is prevented from reaching the sprays by a special liquor strainer. A gas pressure regulator, consisting of a butterfly valve in the suction main controlled by an Askania governor, maintains a constant pressure in the gas collecting main.

The gas passes from the ovens to the primary coolers, which are of the vertical-tube water-cooled type. Three coolers are provided, two of which are normally in operation and one a standby. In these coolers tar and ammoniacal liquor are condensed. From the primary coolers the cooled gas is passed by the exhausters to a W.W-D electro-detarrer of the vertical tube suspended-wire electrode type. The drainage from the primary coolers, exhausters, and detarrer and the overflows from the tar and liquor storage tanks are received in a 2,000-gallon reinforced concrete condensate sump, whence they are transferred to the tar and liquor separating tank by a 1,000 gallons per hour steam-driven pump. A similar pump serves to transfer tar from the

tar compartment of the tar and liquor separating tank into the tar storage tank, which has a capacity of 20,000 gallons.

Two turbo exhausters are provided, each of which is capable of passing all the gas produced at the ovens and delivering it against a maximum pressure of 2 lb. per sq.in. when running at 8,700 r.p.m. The normal working pressure is ¾ lb. One exhauster is normally in operation, the other acting as a standby. To ensure constant suction at the gas inlet to the exhausters, an Askania governor is installed to operate on the turbine of either exhauster.

After leaving the electro-detarrer the gas is passed up a tower type final gas cooler, the oil from which passes to a naphthalene separating sump and is then cooled in a water-cooled tubular type cooler before being re-circulated to the final gas cooler. A certain quantity of oil is periodically withdrawn and passed to the benzole plant, fresh oil being added as a make-up. After final cooling the gas is passed to a static type ammonia washer scrubber. In normal operation they are worked in series, but can be operated independently in emergency. The liquor leaving the washer is received in a concrete sump, from which it is pumped to a 40,000-gallon capacity weak ammonia liquor storage tank. From the storage tank the liquor is pumped through a multitubular type preheater to an ammonia still. The preheater is heated by means of the vapour from the still. The still has a capacity of 800 gallons of crude ammonia liquor per hour, and it is designed to remove, in separate sections, the free and fixed ammonia in the liquor. Before the liquor enters the free section it is treated to remove CO_2 and H_2S in a decarbonating section mounted on top of the still.

The ammonia vapour from the still passes through the pre-heater to a tubular final condenser, the water being arranged to flow in counter current to the vapour. Two 500-gallon running tanks are provided to receive the finished liquor from the final condenser; from these tanks it is pumped to an 8,000-gallon storage tank. A catch tower is provided at the concentrating plant so that any escape of gas is scrubbed with water. Lime slaking and mixing apparatus is provided, a centrifugal pump being installed to deliver the milk of lime to the liming still. The waste liquor from the still is received in a concrete settling basin. The concentrated ammonia plant is designed to produce liquor of 17% strength.

The main by-product building is constructed entirely in red brick and houses the exhausters, boosters, pumps, and Connersville meter. The detarrer generator house is an annexe to the main buildings. The exhausters, Askania regulator, and instrument panel are carried on a raised platform inside the by-product building. A door from this platform gives access to the flat-roofed house which carries the detarrer.

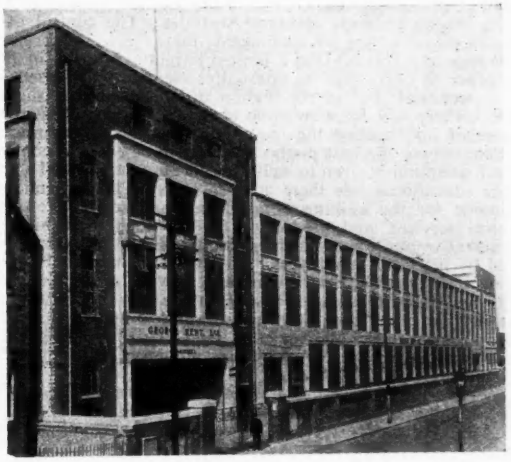
After leaving the ammonia washer scrubber the gas is debenzolized in three hurdle-type scrubbers. Two of these are existing scrubbers, re-used after being cleaned and re-packed. The third scrubber is new. On its way to the still, the cool benzolized oil is first passed through an indicating wash oil meter and a vertical tube type vapour-to-oil heat exchanger where heat from the benzole vapour leaving the still is transferred to the benzolized wash oil. The wash oil is then steam-heated in one or the other of a pair of final heaters and enters the cast-iron wash oil still. This is composed of 14 trays, where the benzole is removed by intimate contact with steam. The benzole vapour passes from the still through the vapour-to-oil heat exchanger and a tubular cooler to a 1,000-gallon running tank, whence it is pumped to an existing storage tank. The debenzolized wash oil from the still is passed through a primary wash oil cooler, consisting of eight banks of 4-in. cast-iron pipes over which water is sprayed, and then through a final cooler with three banks of 2-in. galvanized pipes. Five new wash oil circulating pumps are installed, all of the steam-driven single-cylinder type and of 2,250 gallons per hour capacity. Three serve to pump oil over the scrubbers in counter-flow to the gas, one to pump benzolized wash oil to the distillation apparatus, and one as a spare.

A single-lift gasholder of 50,000 cu.ft. capacity is provided for storage of surplus gas. A main fitted with an automatic valve is connected to a bleeder 90 ft. in height, and is controlled by the position of the holder. A further main is connected to the gas compressors and is fitted with a similar automatic valve. The first valve opens when the holder is full and the second closes when the holder is nearly empty. The equipment for boosting the surplus gas into the Sheffield Gas Grid consists of two gas compressors each capable of taking 1,500,000 cu.ft. of gas per 24 hours and delivering it at a maximum pressure of 21 lb. per sq.in. These compressors are both steam driven and one acts as a standby to the other. Two turbine-driven boosters, each of 30,000 cu.ft. per hour capacity, supply gas to the South Yorkshire Gas Company. The gas is purified and metered on the plant and pumped direct into the service mains.

A Notable Centenary

George Kent, Ltd., Celebrate a Hundred Years of Service

"Many firms have Centenaries, but few there are that have been conducted over the whole of that period by two successive generations of one family."



The Luton Works.

The above quotation is taken from the very fine brochure which George Kent, Ltd., published in connexion with their centenary, which they celebrated last week, and it typifies the friendly family spirit which permeates the whole firm.

It is a far cry from the idea of George Kent's "Milk-Saver"—a small piece of earthenware placed in an ordinary saucepan—to the automatic control of plant producing steam power equal to that of 200,000 horses. Yet both had a common purpose—economy and control in the action of boiling. But this great step from the one to the other represents, in material shape, the progress and advance in the activities of the firm during a hundred years of service.

In the course of their Centenary Celebrations, the firm entertained at their Luton works last Friday a party of Press representatives, Sir Walter Kent, C.B.E. (Chairman and Managing Director), presiding at a luncheon at the George Hotel, which followed an interesting tour of the works.

The best epitome of the firm's progress and activities will be found in the words of the Chairman, who addressed the guests after luncheon. "My father," he said, "the late George Kent, was born in 1806, and after serving an apprenticeship with Messrs. Barretts, then of Piccadilly, started in business for himself about the year 1833 as a maker of blinds and other household appliances. He may be described as being a pioneer, if not *the* pioneer, of domestic labour-saving inventions. His name became known far and wide in connexion with the rotary knife-cleaning machine, of which he was the inventor, and which continued to be in great demand until the coming into general application of the rustless steel table knife, which rendered the knife-cleaning machine unnecessary. It is not for me to describe his early struggles, but your imagination will paint for you the picture of the uphill task that he had, starting with practically no capital to maintain and develop a business constantly expanding and requiring more and more money; but he did it.

"Fifty years after his founding the business—and it is of interest that this great departure in the nature of the firm's work

should have commenced at the half-way house in its age—water measurement work was introduced in the shape of the Uniform water meter, and from this one small engineering shoot grew a great tree, which, so far as the firm is concerned, may be compared to the banyan tree, spreading over a wide field of commercial enterprise and dropping its roots here and there into many varied industrial processes. In doing this, science has combined with art in the employment of the great motive forces of modern life—mechanics, hydraulics, electricity, pneumatics, and chemistry.

"As in the beginning of the business the firm's work lay in pioneering aids to life within the house, so to-day it is our endeavour to assist the varied services that contribute to the amenities thereof, and one of the means by which that aim has been implemented is in expanding the use of differential pressures in measuring the flow of all fluids.

"This development of the firm's work was founded upon the researches of Giovanni Battista Venturi, which were closely allied to the work of Bernouilli. Venturi in 1797 established after a long and meticulous series of experiments and observations the laws pertaining to the flow of water in converging and diverging pipes; these laws were put to practical use by Clemens Herschel, the great American Hydraulician, who, in 1887 constructed the first meter employing this principle, which, with a rare and commendable modesty, he named 'The Venturi.' The knowledge

Sir WALTER KENT, C.B.E.,
Chairman and Managing Director.

of the efficiency and success of this new method of measuring water in bulk was imparted to the engineering world in a Paper read before the American Society of Civil Engineers in 1888, and through the perspicacity of George D. Robertson, the Manager of the Water Meter branch of our business who happened to be in the United States shortly afterwards, we succeeded in obtaining the rights for the whole world to make and sell this meter, with the exception of the Continent of North America.

"The growth of the use of the Venturi meter has been phenomenal. One thought at first that it would only be required for large trunk water mains, but to-day it is employed on mains of all sizes and in the measurement of fluids of many varieties and consistencies.

"Closely allied with the Venturi and arising from the principle of differential measurement, the use of the orifice in many special instances has developed and has been made an integral part of our work. In this we were very fortunate in having on our staff the late Mr. John Lawrence Hodgson, who was regarded as a high authority upon this principle which now figures so widely in applied engineering science.

"It is the firm's claim to measure and control the flow of all fluids both liquid and gaseous, and the modern practice of automatically controlling industrial processes has led to a further development of our activities. This may be said to be the age of automatic control; whether it be steam-raising, sugar purification, paper-making, water and sewage purification, automatic control is rapidly taking the place of adjustment by hand. Apparatus and methods to this end have already been brought to a high state of efficiency. It is, for instance, of absorbing interest and a matter of no small wonder to see the master-controller, not much larger than a clock that might stand on a drawing-room mantelpiece, governing with undeviating precision a battery of boilers capable of raising 500,000 lb. of steam per hour at a pressure of 450 lb. per sq.in. No matter how sudden or how often the variations of load, steam pressures are kept constant within a variation of less than 1%—an efficiency with which no hand-control, however fully staffed, can compete.

"Perhaps some super-physiologist could draw a parallel between human and mechanical control, but the vast amplification of power brought into operation by the minute effort of the automatic observer or detector almost overtops one's arithmetical conception. But taking as an example the galvo-torque of the 'Multelec' detector, and representing it by a column of water 1 in. in height, the output torque controlled and operated thereby would be represented by a column 50 million miles high. Could our physiologist give us parallel figures to represent the power exerted by eye and brain in detecting as against that of the hand in operating?

"These are suggestions of what can be done, and of what is occurring in many of the more important industrial processes to-day. It makes for a good product and a cheap one, and its use must grow.

"I should like, in conclusion, to express the most grateful thanks of my firm to the Press, not only for their kindly co-operation in the celebration of our Centenary but for the great part they play in bringing to the eyes of the man engaged in any industrial process the knowledge of how he may be helped the better to play his part in building the great edifice of the complicated industrial life of to-day."

The grateful thanks of those present, together with a cordial expression of good wishes to the Chairman, accompanied by musical honours, was voiced by Mr. John Benn.

On the previous day Sir Walter had been made the recipient of a silver salver and coffee set from the works staff and a bronze plaque, executed at the works, was put up to commemorate the event.

The Firm To-Day.

In conclusion, a word about the firm as it is to-day. The Luton Works occupy nearly seven acres, and have a floor area of over 280,000 sq.ft. It is the largest business in Great Britain, and the third largest in the world, employed in the manufacture of industrial instruments and controllers. The number of employees is now 1,750, including those at 199, High Holborn and at the Electric Motor Works at Hibbert Street, Luton.

Abroad, the firm has offices in Australia, South Africa, and Malaya, and agents in all Dominions and Colonies, and in most foreign countries. From 1906 to 1937, the firm owned an Engineering Works at Perth, Western Australia. The control of this works has now passed to their agents there.

The firm was formed into a limited liability company in 1907.

In order to cope with its unusually scientific and varied business, a technical staff of the highest order has been brought together. There is a large research staff, with laboratories, for the purpose of investigating the requirements of the latest processes, and determining the best methods of measurement and control.

Much attention is given to welfare, education, and social activity. On the educational side there are two schemes of apprenticeship, the junior for the training of craftsmen and recruits for junior technical services, and the senior for the higher technical and administrative positions. Each grade has its own technical school, staffed by the firm's employees. So successful has this Education Scheme been that there is a continual flow of applications from clients for ex-apprentices. These men are now to be found in all quarters of the globe, many having risen to high positions.

In addition to scientific societies, there is a flourishing athletic club with sports ground, providing for tennis, cricket, bowls, football, and hockey.

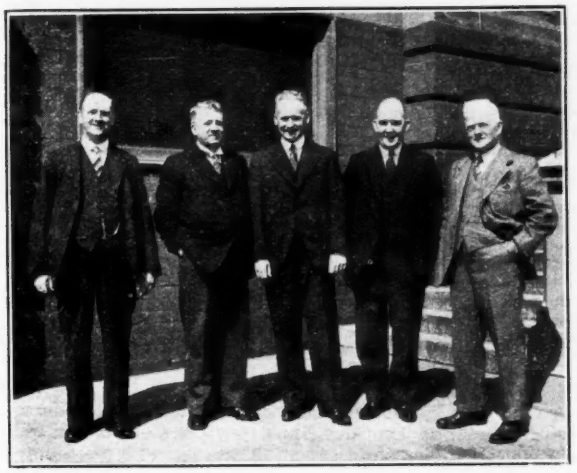
It is pleasing to note that 111 of the present employees have been with the firm for more than twenty-five years, many of them for forty or fifty years, so that in the aggregate these 111 men total 3,895 years' service.

Athletic and Social

Nottingham Pensioners' Outing.

Pensioners of the Nottingham Corporation Gas and Lighting Department had their annual outing on June 16, when they journeyed by motor coach to Matlock Bath. The expenses were defrayed by the Benevolent Fund, the Secretary of which, Mr. Jack Ault, was chiefly responsible for the outing.

Waverley Association of Gas Managers



Left to Right.—R. J. Philp (Hon. Secretary and Treasurer), Councillor Walter Muter, J.P. (Convener of the Edinburgh Utilities Committee), D. D. Melvin (President), James Jamieson (Engineer and Manager of the Edinburgh Corporation Gas Department), and Councillor Duncan (Convener of the Gas Committee).

The 122nd Meeting of the Waverley Association of Gas Managers was held on June 17 in the Y.M.C.A. Hall, Edinburgh—the PRESIDENT, Mr. D. D. Melvin, Assistant Engineer and Manager, Edinburgh Corporation Gas Department, in the Chair.

The Business Session.

The PRESIDENT extended a welcome to all present and the minutes of the last meeting of the Association were read by the Secretary, Mr. R. J. Philp, North Berwick, and approved.

The statement of accounts, being in the hands of members, was approved.

The SECRETARY intimated a number of apologies, including one from Mr. J. Jamieson, Engineer and Manager, Edinburgh Corporation Gas Department, who expressed regret at his enforced absence from the business session and paid tribute to the excellent qualities of Mr. Melvin.

The PRESIDENT referred to the death of Mr. David Vass, formerly Engineer and Manager at Perth, who had been President of the Association in 1894-95 and again in 1929-30.

New Members.

The following were admitted to membership of the Association:

Ordinary Members.—Messrs. Stephen C. Johnstone (Engineer and Manager, Dumfries); A. C. Rea (Engineer and Manager, Perth); R. Congalton (Engineer and Manager, Kilbarchan); James M. Dow (Engineer and Manager, Kirkcaldy); John McMurray (Engineer and Manager, Alyth); Thomas McDougall (Engineer and Manager, Linlithgow); and W. C. Campbell (Manager, Galashiels).

Extraordinary Members.—Messrs. C. A. Chapman; H. Gillespie; D. M. Robinson; E. B. Craddock; Duncan Campbell; George M. Buchan; and A. Stewart Knox.

The New President.

In nominating Mr. David Fulton, Engineer and Manager, Helensburgh, as President-elect, Mr. MELVIN said that Mr. Fulton had made many notable contributions to the Gas Industry. He had been a pioneer in the manufacturing of cheap gas. He had already served as President of the North British Association of Gas Managers and would carry out his duties as President of the Waverley Association in a most able manner.

Returning thanks for his election, Mr. FULTON said he appreciated very highly the compliment that had been paid to him. He would promise to do his utmost to see that the traditions of the Chair were not impaired.

Mr. R. J. Philp was unanimously re-elected Secretary and Treasurer.

Messrs. Robert Taylor (Haddington) and R. J. Gavin (Melrose) were elected members of Committee for the next two years.

Mr. John O'Halloran was re-elected Auditor.

The Waverley Prizes, consisting of books to the value of three guineas and two guineas respectively, were announced by the President as having been won by Mr. S. G. Melville (Edinburgh) for a Paper on "Electricity in Gas-Works" and Mr. David S. Davies (formerly of Alexandria and now of Hornsea) for a Paper on "Gas in the Textile Industry." Mr. Melville, being present, received his award from the President.

Presidential Address.

Thereafter Mr. Melvin delivered his Presidential Address, which will be found elsewhere in our issue to-day.

Mr. W. B. McLusky (Halifax) presented Mr. Melvin with the Association Medal, and Mr. MELVIN expressed his thanks.

Mr. J. BRIDGE (Elland) proposed a vote of thanks to the retiring President and Office Bearers.

Luncheon.

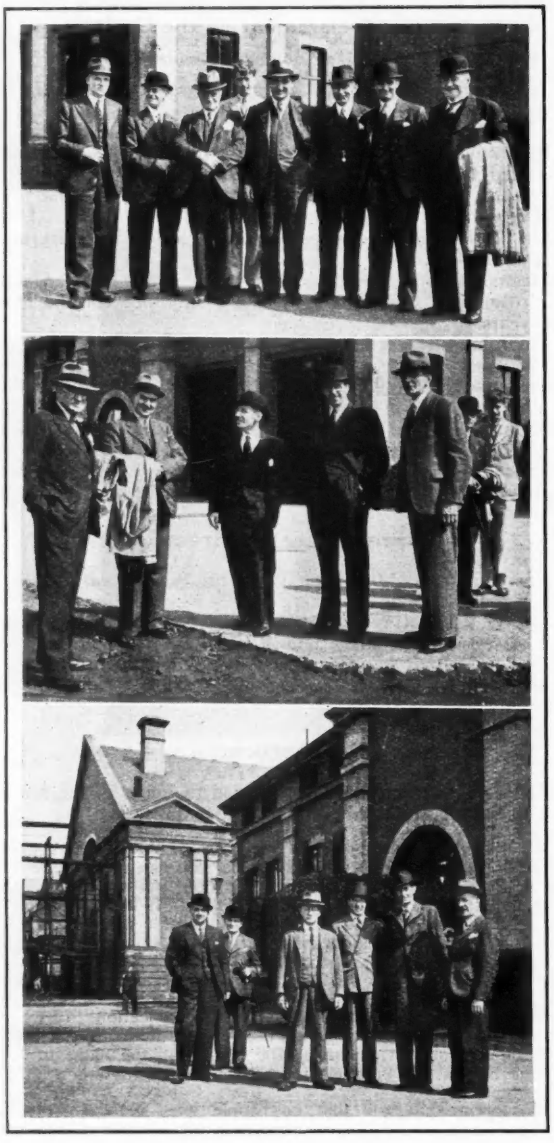
The company afterwards proceeded to lunch in the North British Station Hotel, Mr. D. D. MELVIN presiding.

Mr. DAVID FULTON proposed the toast of "Kindred Associations." The Waverley Association, he said, claimed to be the oldest gas association in the United Kingdom and had a numerous progeny, which it should regard with pride. It had its origin in steps being taken to restrain the activities of a bogus company promoter, who was intruding into the Industry. There were many gas associations to-day and each served its own individual purpose. The Institution of Gas Engineers, for example, contributed in a classical way to their store of technical knowledge. He was glad to think there was a movement towards unification. It would prevent associations intruding on each other's domains and doing each other's jobs. He coupled the toast with the name of Mr. George Braidwood, President of the North British Association of Gas Managers.

Mr. BRAIDWOOD said that no people were more anxious to promote good feeling and harmony than the Scottish people, and this applied specially to Scottish gas managers. Some of them thought so much of gas associations that they were members of several, the Waverley, the North British, the Institution. He had mentioned them, they would notice, in their order of importance. [Laughter.] Each association had its own particular characteristics. The Waverley Association prided itself on its independence and for 77 years had stood on its own legs. It was characteristically Scottish. It put up its President's Address for criticism. The question of affiliation seemed to be a sore point with some of them. Why should they suffer from an inferiority complex? Their Association was the oldest of its kind in the world. Why not ask the Institution and the others to affiliate with them?

Councillor WALTER MUTER, J.P., proposing the toast of the Chairman, said that Edinburgh Corporation was proud to know

that one of its own staff was in the Chair of that Association. The Association had been in existence for 77 years. It met once a year for the Presidential Address and for social functions and had one business meeting each year. What was the *raison d'être* of its existence? He felt the time had come for a reconsideration of the various activities in which they were all engaged. Mr. Fulton had spoken of the various associations. Was their Industry being well served by a diversity of activity spread over a large field or would it be better served by some cohesive organization for the benefit of all? Personally, he thought that Corporation gas officials were insufficiently remunerated. They were



trying to interest the Institution in this matter. His view was that the Gas Industry should lay down conditions of employment for its officers. There should be a system of zoning and grading, and municipalities and undertakings should be made to view the emoluments of their officers in a more favourable light.

Mr. MELVIN, replying to the toast, said that in Councillor Muter the Industry had one of its ablest supporters. His ability to get to the heart of their problems had been shown to a marked degree. Councillor Muter was standing for Parliament, and if he were successful, as they all hoped, their Industry would have no uncertain exponent in Westminster. He desired to thank Mr. Jamieson for his help during his year of office and also expressed his gratitude to Messrs. Philp and O'Halloran.

Granton Gas-Works.

After luncheon many of the visitors were conveyed by coach to the Granton Gas-Works, which by courtesy of the Gas Department were thrown open to inspection.

Subsequently tea was served in the hall (one end of which constitutes the Works Laboratory), and Mr. A. KELLOCK (Airdrie) proposed a hearty vote of thanks to the Edinburgh Corporation. Gas men, he said, could always keep abreast of the times by visiting Granton.

Councillor DUNCAN, Convener of the Gas Committee, acknowledged the vote.

Mr. J. JAMIESON proposed a vote of thanks to the President, congratulating him on attaining that office while still in the position of an "Assistant" in the Industry. He was proud of Mr. Melvin's attainments. Mr. Jamieson took the opportunity of referring to the co-operation which existed in the East of Scotland in the disposal not only of coke but of all by-products; and he would like to see such co-operation extend all over Scotland and over the Border.

Mr. MELVIN then wound up the proceedings.

Golf Competition.

A Golf Competition was held over Baberton Golf Course, Juniper Green, on Thursday, June 16. The Competition was held under the Stapleford system of scoring, with the following results:

SECTION I.

		Points
1st	John Pollock, Glasgow	37
2nd	P. Blackhall, Edinburgh	35⅞
3rd	D. H. Munro, Glasgow	35
4th	R. B. Waddell, Polmont	34⅛
5th	H. Rule, Stirling	33½

SECTION II.

1st	L. Fletcher, Glasgow	35
2nd	W. McRobbie, Edinburgh	34½
3rd	Ian Smart, Monifieth	34½
4th	C. Hamilton, Loanhead	33½
5th	D. R. Waddell, Coldstream	32

Bowling Competition.

A Bowling Competition was held on the Juniper Green Bowling Club's Green on June 16. The winning rink, which finished 28 shots up, was comprised of Messrs. R. Allen (Glasgow), J. Storrier (Forres), and A. Craig (Kilwinning), skip.

Keith Blackman, Ltd.

The forty-eighth annual report of the Board of Directors of Messrs. Keith Blackman, Ltd., states the amount of business done during the year, considerably exceeded that of the previous year. The Directors are pleased to state that all the new preference and ordinary shares issued in accordance with paragraph 2 of the last annual report were subscribed for and allotted in full. Satisfactory progress has been made with the erection of the new works and offices at Mill Mead Road, Tottenham, and production has commenced in the plate work section. Out of the amount received for premiums on the new preference and ordinary shares—viz., £65,000—the sum of £50,000 has been transferred to reserve account, after writing off expenses of issue, and further amounts off plant, and freehold land and buildings at Arbroath. After providing for payment of preference dividend and making sufficient allowance for depreciation and reserves against doubtful debts, and National Defence Contribution and income-tax on the year's profits, the audited accounts show an available balance standing at the credit of the profit and loss account of £62,803. The Directors recommend that this sum be appropriated as follows: Declare a dividend on the ordinary shares at the rate of 20% per annum, less income-tax at 5s. 6d. in the £, on 400,000 fully-paid ordinary shares of 10s. each, Nos. 1 to 400,000 for 12 months ended March 31, 1938, £29,000, 100,000 new fully-paid ordinary shares of 10s. each, Nos. 400,001 to 500,000 for three months ended March 31, 1938, £1,813, absorbing £30,812 10s. The carry-forward to the current year is £31,991. In view of the growing size and importance of the business, it has been felt necessary to elect two additional Directors. The following gentlemen have, therefore, been elected to fill the vacant seats: Mr. D. M. Brown, Chief of the Ventilating Department, who has been in the service of the Company since 1899, and Mr. D. S. Woodley, the Company's Chief Engineer, who joined the staff in 1915.

WAVERLEY ASSOCIATION OF GAS MANAGERS

THE PRESIDENT.

Educated at Rutherglen Academy and the Royal Technical College, Glasgow, Mr. D. D. Melvin received his training at the Dalmarnock Works of the Glasgow Corporation Gas Department. He subsequently held appointments with the County Council of Lanark at their Uddingston Works, first as Assistant Engineer and Manager and latterly as Manager. He was appointed to his present position as Assistant Engineer and Manager at Edinburgh in 1933. Mr. Melvin is a Past-President of the Scottish Junior Gas Association (Western District).

Presidential Address*

OF

D. D. MELVIN,

Assistant Engineer and Manager of the Edinburgh Corporation Gas Department.

Presented at the Annual Meeting of the Association held in Edinburgh on June 17.

Although our Association is the oldest gas association in the country, age itself should not warrant us occupying a position of comparative insularity in matters concerning the technical advancement of our Industry. I refer to the question of affiliation. This question of affiliation to The Institution of Gas Engineers is a contentious one, and I am probably treading on delicate ground in broaching it; but I feel that we could contribute usefully through representation on the Institution Council to the work being carried on.

Use of Cannel.

The reason for the decline in the use of cannel for gas making purposes is common knowledge, but the reintroduction of cannel, of the appropriate quality, for gas making purposes and the examination of its products in the light of scientific progress in their treatment is a subject which has been thoroughly explored in Edinburgh. The results of these investigations, which have been carried out by my Chief, Mr. Jamieson, in conjunction with the Fuel Research Station, have been published in two papers delivered before The Institution of Gas Engineers, the first[1] descriptive of the work carried out at Granton and the second[2] describing the experimental work carried out at the Fuel Research Station on the treatment of cannel at low temperatures. The subject is dealt with further in a paper[3] submitted to the International Conference of Petroleum Technologists by Mr. Jamieson and Dr. King which sums up the work already done, explores the recommendation contained in the second report of the Oil from Coal Committee of the Scottish Development Council that the Gas Industry should be encouraged to use suitable cannels, and makes suggestions regarding the utilization of cannel by the application of modern methods of coal treatment.

To sum up the results of these investigations, it may be said that cannel can be utilized immediately for gas manufacture, particularly where vertical retorts are in use, and would contribute materially to the home production of oil at no greater cost of production per therm of gas. The yields of oil would justify the renewed production of cannel in quantity and the exploration and confirmation of our cannel deposits.

Coal.

We have looked for adequate safeguards in the recent Coal Bill to protect the price of our principal material—coal. These have not been forthcoming, although certain assurances have been given by the coal owners to the Government. These assurances are vague in terms, particularly regarding price, and it is difficult to see wherein our Industry is safeguarded, especially when a contract for coal, the price of which is in dispute, must be accepted while the matter is investigated, and the specified quantity taken irrespective of the decision. While the attitude regarding price is a slight advance on the position taken up by the Coal Consultative Committee who formerly would not hear prices mentioned, it would appear that the net result will be negligible until such time as the present exceptional demand for fuels for the heavy industries has abated.

It would appear, too, that the coal industry is fearful of the continued advance in the use of gas and electricity and is determined to retard this development, and by maintaining and increasing prices to public utilities hopes to reduce prices for domestic consumption and so encourage increased consumption of raw coal irrespective of the ultimate effects this would have.

Coal Purchase by Specification.

At a recent luncheon, Sir Philip Dawson, President of the Institute of Fuel, said:

> "It was only comparatively recently that, largely as the result of demand of the gas and electric industry, coal owners were realizing that quality—*i.e.*, chemical analysis, ash content, heat value, and accurate grading according to size—was essential to the consumer, and that pre-treatment and blending formed an integral portion of the coal-owners' business."

If the present increase in prices is to be permanent it will be necessary to translate these qualities into terms of £.s.d. with penalties for non-compliance. The sizes of washed smalls, for example, must be standardized and allowances made for ash and moisture content. Water at 20s. per ton is dear when it can be obtained at 2d. Allowances were made formerly to encourage the use of washed smalls on account of their excessive moisture content, and rightly so. Ash content and inert materials in screened coals are much too variable. The deterioration in quality is only too obvious during periods when coal is in demand and deliveries must be accepted to keep the plant in operation when otherwise they would be rejected. Complaints cannot now be investigated and settled on the spot. Months of delay occur and the only remedy seems to be to insist on a definite specification of size, ash content, moisture content, and quality with adequate penalties.

Formerly we could test and assess any coal and obtain a coal or mixture of coals which would produce the desired result—lowest cost of production—according to local condi-

* A short section of the Address, dealing with the distribution system in Edinburgh and the extension of area of supply, has been omitted from our report.—Ed. "G.J."

[1] J. Jamieson and J. G. King, Publ. 135/34, Inst. Gas Eng., 1936.

[2] J. G. King and J. Jamieson, Publ. 162, Inst. Gas Eng., 1937.

[3] J. Jamieson and J. G. King, Inst. of Petroleum Technologists, 1938.

tions and methods. This procedure and method is, under present circumstances, almost impossible to apply. In Edinburgh we were, not without justification, proud of the working results which were attained by careful selection and blending of caking coals and smalls from the west with the locally-produced Lothian coals. Formerly the blend was regular in proportion, but now, with increased coal consumption, these blending coals are available only in reduced quantities, and often quality, and we have been compelled to buy at increased prices coals which are not so suitable, with consequent increases in cost of production out of all proportion to the increase in the cost of coal.

Clauses regarding acceptance of colliery weights and equal monthly deliveries are now put forward for acceptance, and while these, so far, have been successfully resisted in Edinburgh, it would appear that deliveries are being made such as to force some amount of stocking and withdrawal from stock as part of ordinary routine. These methods are unacceptable. Scottish coals are such that where these are non-caking or weakly-caking, and the majority fall into this category, storage for even a limited period results in heavy depreciation in gaseous yields and particularly in coke-producing qualities.

Markets for Gas.

I often think that in the sphere of marketing, the Gas Industry is in danger of being unable to distinguish between the wood and the trees. True, the Industry has of late shown signs of becoming sales-conscious, if by that we mean that it is beginning consciously to develop the art of exciting the desire of the public to own specific articles by persistently advertising them in various attractive ways.

This art of sales appeal is, of course, a necessary part of any marketing policy, but it *is* only a part, and it is this fundamental fact which I think we are inclined to forget. In all the welter of exhibitions, cookery demonstrations, showrooms, propaganda, and advertising we hardly pause to ask the question, "Whither are we going?" Yet it was never more necessary than to-day to look beyond the affairs of the moment and consider a policy for the future. That policy must be a true marketing policy, relying not only or even principally upon selling devices with a transient appeal, but upon real service to the community. We must remember that *no* goods, however attractively displayed, will continue to sell unless the buyer feels that he has secured value for money in the service he gets from them, and we must remember above all that in our business a successful sale is not one which yields an immediate profit on the transaction, but one which will continue to yield a profitable revenue for years to come.

One thing the Gas Industry in Scotland did do when threatened with the loss of its lighting load: it introduced a policy of supplying cookers on free loan and cheap simple hire. That was a long-term policy of marketing as opposed to mere selling. The Industry realized it had something good to sell in gas cooking and set about deliberately to finance that load in its initial stages. That policy has been amply justified by results. Until quite recently hardly any domestic consumer thought of cooking in terms other than gas, builders provided gas cookers in new houses as a matter of course, consumers are to-day prepared to buy their gas cooking equipment and, in short, cooking has become the Industry's base load on the domestic side.

Gas for Water Heating.

There is surely a lesson in that for the future. To-day we have another good thing to sell in gas water heating, but we have become so obsessed with the idea of selling water heaters as such that we are forgetting the end in a misguided idea of the means. The end which I visualize is universal domestic water heating by gas. Should the means to this end be similar to the methods adopted to popularize the gas cooker?

The free loan cooking policy has cost the Edinburgh Gas Department the best part of a quarter of a million pounds in the capital cost and replacement of free loan cooking appliances alone, and other Scottish undertakings must have spent proportionately. That expenditure has paid handsome dividends and it might be said that a similar investment in water heating would pay no less handsomely.

We in Edinburgh have been steadily building this load during the past few years and, while the results have not been all we would like them to be, we are installing some 700 new water heating appliances per annum. Comparing this progress with that of undertakings in the south we feel we should be doing very much better notwithstanding the supposed "increased sales resistance" in the north.

We have had fairly successful results from our "all-in" charge for gas of 3d., 3½d., and 4d. per day respectively for storage heaters of 20, 25, and 30 gallons capacity, but even with this running charge the high initial cost of the heater and its installation is an obstacle to rapid progress. The same obstacle arises with heaters of the multi-point type where a flue pipe must be provided, and at the present time we are investigating the possibilities of reducing this initial charge to the consumer and endeavouring to assess the effect this would have.

In Scotland the benefits of a copious hot water supply are available in every household and the back boiler with the living room fire is an almost universal practice. The housewife feels, therefore, that since she must have a fire in any case she might as well use it at apparently no extra cost to heat the domestic water supply. On the other hand, we know from their testimony that those who have adopted gas heated hot water installations, be they of the storage or instantaneous type, would not return to their former methods. This nucleus of satisfied consumers, by their personal recommendations, have possibly more effect than countless pamphlets and advertisements. Our problem, therefore, is to enlarge this nucleus by every means in our power.

Opinions differ as to the best method of procedure. Should the appliance and the cost of installation be subsidized? Many are opposed to selling appliances below cost; they maintain that installations should be charged for at prices which will, on the average, cover the whole cost, including overheads, with the object of keeping gas prices and therefore running costs at the lowest possible levels.

Others, again, say that it is doubtful if this ideal policy will increase our water heating load as rapidly as it ought to increase, and point to the results obtained by the policy adopted to capture the cooking load, forgetting perhaps the relatively less effect this had on the then higher gas prices.

Obstacles to Progress.

As I see it there are three practical obstacles in the way of selling water heating by gas:

(1) Lack of knowledge of gas water heating on the part of the public.
(2) High cost of installation.
(3) Comparatively high running costs.

One would imagine that the intensive advertising in the Press and the wholesale distribution of advertising literature which have been undertaken by the Gas Industry would have dissipated the first obstacle ere this, yet we are constantly receiving evidence to the contrary. There is no doubt that advertising of this kind, to be effective, must be carried out more intensively, more persistently, and on a bigger scale than the Industry has yet attempted, and even then it must be supplemented by personal persuasion and demonstration on the customer's doorstep.

High cost of installation is a relative term. I have known individuals who owned motor cars costing perhaps a hundred pounds a year or more to run, who maintained that they could not afford the luxury of a gas water heater. This apparent contradiction can only be explained, I think, by two factors. First, that they are satisfied with their present means of supplying hot water, however inconvenient or inefficient, and, secondly, that the desire to own a motor car is many times stronger than the desire to own a gas water heater. The second factor is, I think, far and away the stronger of the two, and to explain it fully would involve us in a whole world of psychological theory. But the fact remains, and our problem is to create that overpowering desire for our water heaters which in the motor car business induces customers to part with relatively large sums of money.

The third obstacle is the comparatively high running costs, that is, when compared with solid fuel and taking fuel cost only into account. While progress is being made on the flat rate basis of charge for gas, progress such as we anticipate or would like to anticipate will only be made when the running cost can be quoted in terms competitive with solid fuel, taking into account the added advantages of gas. The potential water heating load warrants terms of this order.

We must therefore address ourselves to a solution of these problems. Intensified selling by reinforced and well-informed sales staff; market research to explore the possibilities and gauge the probable effects of any proposed policy; scales of charges, competitively framed, but sufficiently remunerative to cover the "service" which follows an installation; more persistent and continuous advertising are all required if our object is to be attained.

The City of Edinburgh covers an area of 50½ square miles, but the gas supply area covers over 116 square miles, including as it does one parish to the south-east and four parishes to the west of the city boundary. A considerable portion of the area is undeveloped, particularly the outlying parishes, and the actual area over which gas is supplied is 53½ square miles. The area is roughly rectangular in shape, the greatest length being 19½ miles and the greatest width 13 miles. It is bounded on the north by the estuary of the Forth and development is taking place mainly to the south and west. The works are practically at sea level. The area of supply is somewhat hilly in character, rising as high as 684 ft. above sea level in one part. The rising nature of the ground is an aid to gas distribution, but it also brings its problems when the aim is to supply gas at an even pressure to every consumer whatever the demand.

Progress in Added Areas.

All the villages to which a gas supply has now been provided have had an electricity supply for some years and in the circumstances the response to our canvass has been most encouraging, as the following table shows:

	Premises Canvassed.	Premises Connected.	Appliances Fitted.
Ratho, Newbridge	221	210	217
Kirkliston	146	130	131
Winchburgh	409	400	488

All houses have taken cooking appliances and many orders have been received for gas fires. These appliances have been fitted without recourse to showroom facilities or display, and considerable improvement should result from our proposed travelling showroom visitation.

In South Queensferry the additional appliances fitted in 20 months number 397. When one remembers that there are only 1,011 consumers, of which 437 are prepayment, and that they have been provided with a gas supply for many years, the result shows that, given the right policy, considerable advancement can be made in areas where capital expenditure has been curtailed or limited.

Notwithstanding the reduction in price of 28% the first effect of the supply of gas from Edinburgh was a reduction in consumption, proving that although the gas previously supplied was supposed to be of similar calorific value it must have been considerably less. Monthly increases of 10% are now being recorded. A differential rate of 5d. per therm is a high one, but the extension could not be undertaken with less. At the Public Enquiry the Director of Gas Administration questioned this rate, but on the figures submitted sanctioned its incorporation in the Order.

The Gas Committee, with a view to encouraging the sale of gas as much as possible, agreed to a rate of 4s. 6d. per 1,000 cu.ft., or 3d. per 1,000 cu.ft. less than authorized; this rate, following the scale within the city, drops to 4s. 0·5d. per 1,000 cu.ft. after the first 5,000 cu.ft. per quarter. Prepayment consumers are charged 1·5d. per 1,000 cu.ft. extra on the first 5,000 cu.ft. per quarter only. When it is kept in mind that the price of gas in South Queensferry prior to purchase was 5s. 10d. for ordinary consumers and 6s. 11d.-6s. 3d. per 1,000 cu.ft. for prepayment consumers, with few of the advantages of the Edinburgh conditions of supply, and that the price in Ratho prior to the works being closed was 11s. per 1,000 cu.ft., it will be agreed that the differential price is not excessive.

The method in use for assessing the return on any proposed extension of the gas supply to housing schemes and estates is somewhat arbitrary but gives a good indication of whether the proposed extension will be remunerative or not.

Supply to New Houses.

As soon as the warrant for the erection of the premises has been granted by the Dean of Guild Court, who supply a weekly list of the petitions, a call is made on the architect or builder and a plan procured showing the layout of the scheme. The question of the provision of gas and the number of points to be provided is discussed and assistance given in the specification for the internal carcassing should this be required. By agreement this piping is run from the meter position to the appliance position by the builder or purchaser. An estimate is then prepared and to the estimated cost of laying the necessary mains is added the portion of service pipes laid free and the cost of providing meters and free loan cookers if required; 5% of this sum is taken, and should the estimated consumption of gas at 9d. per 1,000 cu.ft. (1·9d. per therm) equal or exceed this amount, the mains are provided without further question.

The estimate of gas consumption is based on the following scale:

	Cu.Ft. per Annum.
Cooker	15,000
Fire	5,000
Wash boiler	3,000
Hotplate	6,000

When, on the above basis, the supply is not remunerative but will provide for future development within a reasonable period the supply is now provided free of cost. Formerly in these circumstances a consumption guarantee for 5 years had to be made by each consumer requiring a supply, a condition that gave rise to considerable friction and correspondence where, in newly developing areas, the guaranteed figure had naturally to be high. It is now only in exceptional cases that interest payments or guaranteed consumptions have to be made.

Service Pipes.

Service pipes between the main and the meter are laid, maintained, and renewed when necessary by the department whatever the type of property. For new premises, the first 40 ft., and, if the main is on the opposite side of the roadway, half the width of the road, is allowed free of charge. The balance is chargeable but is subject to a rebate of £3 if there is provided:

A cooker, other than free loan.
A wash boiler.
A pipe for a gas fire, complete with stopcock.

Additional rebates of approximately £1 per point are allowed for additional appliances. This charge is made, not so much with the object of recovering part of the cost for installing the service but to act as an inducement for the provision of gas points and/or appliances. Practically all houses erected for sale fulfil the above minimum requirements. All houses built by the corporation for clearance and re-housing schemes and houses built by private builders for letting purposes, assisted by corporation loan, use gas for cooking purposes exclusively, a cooker of the free loan type being fitted.

Free Loan Cookers.

Since the introduction of the extended hire purchase scheme free loan cookers have been displaced by the modern all-enamelled cookers to the following extent:

	%
Slum clearance schemes	12½
Re-housing schemes	25
Medium class houses for letting	50
Houses for sale	90

The policy of retaining control of the service pipe and its subsequent maintenance and renewal ensures a satisfactory

TABLE 1.—*Progress of the Edinburgh Gas Department over a Period of 11 Years.*

Year ended May.	Gas Made Millions Cu.Ft.	Therms Made.	Increase %.	Average Selling Price of Gas. Per 1,000 Cu.Ft.	Average Selling Price of Gas. Per Therm.	Number of Consumers.	Sale per Consumer. Cu.Ft.	Sale per Consumer. Therms.	Appliances in use—Dept. Records.	Gas Sold for Street Lighting. Millions.	Miles of Main.
				s. d.	d.						
1926 ..	2,948	14·7	—	3 4·72	8·14	112,430	23,031	115	—	75	—
1927 ..	3,290	16·4	11·6	3 9·48	9·10	114,234	25,523	128	88,342	77	496½
1928 ..	3,177	15·8	−3·7	3 3·44	7·89	116,436	23,927	120	93,920	84	505¾
1929 ..	3,221	16·1	1·9	2 11·27	7·05	117,706	24,698	124	97,264	81	512
1930 ..	3,267	16·3	1·2	2 11·82	7·16	118,573	24,813	124	99,403	90	521
1931 ..	3,339	16·7	2·5	2 11·82	7·17	119,348	25,291	127	103,943	93	531
1932 ..	3,369	16·8	0·6	2 10·9	6·98	121,145	25,100	126	109,877	92	542
1933 ..	3,459	17·1	1·7	2 10·11	6·92	124,271	24,790	122	116,038	95	560
1934 ..	3,661	17·4	1·7	2 9·02	6·95	126,417	25,891	123	124,151	101	576
1935 ..	3,716	17·7	1·7	2 8·19	6·78	128,379	25,286	120	132,217	111	597
1936 ..	3,936	18·7	5·7	2 6·37	6·39	130,212	26,839	127	141,801	128	609
1937 ..	4,089	19·4	4·0	2 5·31	6·17	132,175	27,158	129	150,561	160	638

supply and has a marked effect on the unaccounted-for gas. The Department is prepared to enlarge, free of charge, any service pipe which is insufficient for the supply to any house or premises through the introduction of additional appliances or any other cause. This is a policy none can afford to neglect.

All service pipes in Edinburgh have, in addition to the stopcock at the meter, a main control cock or valve with toby, on the service pipe on the footpath or pavement. In the case of service pipes 2 in. diameter and over for supplying hotels, restaurants, fish and chip shops, and other premises, which are assumed to have a greater fire risk, these stopcocks or valves are, by arrangement with the firemaster, indicated by "G" indication plates. In case of fire the firemen are allowed to turn off the gas, but not on, and each fire fighting unit is equipped with keys for this purpose. All fires are automatically notified to the department and immediate attention given, night or day.

Collaboration Between Utilities.

Close collaboration exists between the various utilities in the city and the roads department. All openings to be made by the post office, electricity, or water departments are notified so that the opening may be inspected, the gas mains and services safeguarded, and their condition examined. The city roads department's operations are also notified so that, where extensive relaying of roadways is being carried out, service pipes are inspected and renewed where necessary.

A monthly meeting of the officials in charge of these departments is held so that operations can be carried out with the minimum of inconvenience to the general public and unnecessary breaking up of streets avoided.

In addition to these sources, a services renewals scheme is in operation whereby every street in the town is inspected in rotation and service pipes or mains renewed. This scheme serves to bridge the gap between busy spells and it is found in many cases that renewal is overdue.

Progress in Edinburgh has been steady over a period of years. Table 1 gives some of the salient points in this record of progress over the past 11 years.

An increase in output of 32% on the thermal basic over the above period against an increase in the number of consumers of 14·9% is progress in the right direction—increase in the consumption per consumer.

Since the war the therms sold per consumer increased gradually year by year, receiving a decided fillip in the year ended May, 1927—the year of the coal stoppage. Omitting this exceptional year, sales per consumer continued to increase until 1931, when they commenced to decline, although the total output continued to increase. This decline was naturally a cause of concern and notwithstanding the prosecution of a vigorous sales policy and the installation of an apparently satisfactory number of appliances, coupled with a steady decrease in the average price from 3s. 4·7d. per 1,000 cu.ft. (8·14d. per therm) in 1926 to 2s. 10·1d. per 1,000 cu.ft. (6·92d. per therm) in 1933, no material impression was being made.

Revision of Charges.

In 1934 the flat rate charge was 2s. 9·06d. per 1,000 cu.ft. (6·96d. per therm) for ordinary consumers and 3s. 1·62d. per 1,000 cu.ft. (7·92d. per therm) for prepayment consumers with various rates for specified industrial purposes. These ranged from 2s. 3·36d. per 1,000 cu.ft. (5·76d. per therm) subject to discount, to 1s. 6·43d. per 1,000 cu.ft. (3·88d. per therm) net for steam raising, irrespective of consumption, and water heating and metal melting with guaranteed minimum consumptions. Anomalies had been created owing to the development of the use of gas for purposes not covered by these special rates, and in this year, when a further reduction in the flat rate was possible, it was decided to recast completely the scales of charges.

The new scale was to be framed with certain objects in view:

(1) To increase the consumption per consumer by enabling gas to be used for domestic uses other than cooking or lighting at lower rates.
(2) To charge for gas in accordance with the quantity used irrespective of the purpose for which it was used.
(3) To avoid, if possible, increasing the price to any consumer.
(4) To be simple to apply and easily understood.

No special rates were to be made for special purposes as it was felt that a scale could be adopted or developed which would allow of promotional rates sufficiently low for all purposes.

Prices in 1934.

After considerable research the following scale was authorized by the Corporation and put into force in November, 1934:

Consumption over a period of approximately three months through One Meter.	First 10,000 Cu.Ft. Per 1,000 Cu.Ft.	First 10,000 Cu.Ft. Per Therm.	Remainder at one of the following Prices. Per 1,000 Cu.Ft.	Remainder at one of the following Prices. Per Therm.
	s. d.	d.	s. d.	d.
Consumption up to 10,000 cu.ft. ..	2 9	6·947	—	—
Over 10,000 and up to 50,000 cu.ft.	2 9	6·947	2 6	6·316
,, 50,000 ,, 100,000 ,,	2 9	6·947	2 3½	5·789
,, 100,000 ,, 250,000 ,,	2 9	6·947	2 1½	5·368
,, 250,000 ,, 500,000 ,,	2 9	6·947	1 11½	4·947
,, 500,000 ,, 750,000 ,,	2 9	6·947	1 10	4·632
,, 750,000 ,, 1,000,000 ,,	2 9	6·947	1 9	4·421
,,1,000,000 cu.ft.	2 9	6·947	1 6	3·789

In 1935 the scale was amended as follows:

Consumption over a period of approximately three months through One Meter.	First 5,000 Cu.Ft. Per 1,000 Cu.Ft.	First 5,000 Cu.Ft. Per Therm.	Remainder at one of the following Prices. Per 1,000 Cu.Ft.	Remainder at one of the following Prices. Per Therm.
	s. d.	d.	s. d.	d.
Consumption up to 5,000 cu.ft. ..	2 9	6·947	—	—
Over 5,000 and up to 100,000 cu.ft.	2 9	6·947	2 3½	5·789
,, 100,000 ,, 250,000 ,,	2 9	6·947	2 1½	5·368
,, 250,000 ,, 500,000 ,,	2 9	6·947	1 11½	4·947
,, 500,000 ,, 750,000 ,,	2 9	6·947	1 10	4·632
,, 750,000 ,, 1,000,000 ,,	2 9	6·947	1 9	4·421
,,1,000,000 cu.ft.	2 9	6·947	1 6	3·789

The top rate is now chargeable for the first 5,000 cu.ft. per quarter and the second step reduced.

In 1936 the opportunity was taken to revise the prepayment

price, and instead of an added 4·62d. being charged for each 1,000 cu.ft. consumed the charge is now only 1·5d. per 1,000 cu.ft. for the first 5,000 cu.ft. per quarter, any excess being charged at the same rate as for ordinary consumers—2s. 3·5d. per 1,000 cu.ft. (5·79d. per therm). Prepayment consumers, therefore, only pay at the most 2s. 6d. per annum more than ordinary consumers—a charge which is considered sufficient to cover the extra installation and collection charges. Where, as in Edinburgh, both classes of consumer participate in the same free installation, appliance, and service concessions, additional charges of any greater amount cannot be justified.

Development of Present Scale.

The logical development of the scale might have been gradually to reduce the steps, with the exception of the first, until gas was available at about 4d. per therm to all. Unfortunately this development has received a check on account of rising coal and other costs, and a stage has now been reached when, in view of still further increases in these costs or reductions in residual returns, it will be difficult to make further reductions and even to avoid an increase.

Alternatives are therefore under consideration. There are two main ones:

(1) To separate domestic from industrial and commercial consumptions and have different scales, still on the same lines for each, or

(2) To adopt a two-part tariff the commodity rate being not more than 3·5d. to 4d. per therm.

The second of these alternatives holds out the greater attraction at the moment. The introduction of any scale or tariff is a risk. Even with the fullest details available it is difficult to forecast exactly the ultimate financial result, but it is a business risk which it is perfectly justifiable to take.

The two-part and combined rates of our competitor—electricity—are selling scales designed to attract consumption for all purposes once the lighting load is paid at the high rate. In Edinburgh, on the combined rate, the small quota of about 40 units per room is charged at 3d. per unit and the remainder at 0·5d. per unit. Other large towns are almost as low and with regional electricity boards in prospect all districts will soon face similar or even lower rates. Any gas undertaking can evolve and put into operation a tariff to compete with the halfpenny unit, and even if a scale can only be framed to cater for a percentage of the consumers in case of financial loss, one should be adopted and extended as circumstances permit until the 3d. or 4d. therm can be talked of generally.

Analysis of Accounts.

I have added as an appendix (statements 1 and 2) the analysis of the Edinburgh accounts for the years ended May, 1912, and May, 1937, together with other comparative statistics for this twenty-five year period.

The cost figures are shown on the volume and therm basis and also per ton of coal carbonized. In 1912 more tests of candle power were made than of calorific value and the average of 588 B.Th.U. per cu.ft. quoted may not be as fully representative of the gas supplied as the calorific value quoted for 1937.

The compilation, preservation, and study of statistics such as these are a valuable guide in the successful management of any particular concern and the influence over a period of years of changed methods of manufacture, distribution, and sale is marked.

Although wages have increased by over 100% in the case of stokers and gasfitters and 150% in the case of labourers, and although the net cost of coal per ton has increased by 166%, the introduction of vertical retorts, with their improved thermal yields, the choice of suitable coals, the conservation of coke in producers, the recovery of surplus heat, and the production of benzole have gone a long way to keep the net cost of gas into holders only some 37% greater on the thermal basis than the pre-war figure. The net cost of gas figure of just over 2d. per therm would be less for additional loads, for off-peak loads, and for summer loads when alternative tariffs are under consideration.

It must be pointed out, however, that the increase in the cost of coal is not fully apparent in the year under review owing to the influence of long-term contracts, which have now expired, but this is offset in a similar way by the lag in returns for residual products. Further, this position can only be continued as long as the prices for these products can be maintained. The total number of employees and staff is now 1,038 as compared with 806 twenty-five years ago. Although the output has doubled the number of men employed at the works has decreased, due to altered methods of manufacture, but on the distribution side the number of employees has risen from 178 to 454, showing how this side of our business has developed.

Capital expenditure on the undertaking amounts to no less than £3,266,774, having increased by £1,000,000 over the period under review, but in the same period over £2,000,000 have been redeemed. The outstanding capital per million cu.ft. sold is now £235, as compared with £1,020 twenty-five years ago. The influence of this figure is reflected in the net revenue account where, although income-tax has risen from 5d. to over 2s. per ton of coal carbonized, the total capital charges are now 7·29d. per 1,000 cu.ft. sold (1·54d. per therm), as compared with 14·56d. per 1,000 cu.ft. sold (2·48d. per therm) in 1912.

Further reductions in these figures can be contemplated in the near future with appropriate reductions in local rates which goes to emphasize the extremely favourable position of local authority-owned undertakings where a prudent financial policy has been pursued in capital redemption and provision made for depreciation and replacement of plant.

Many interesting comparisons and deductions could be made from these statements and from an analysis of the items which go to make up the total under each head, but to do so in full would require a Paper by itself.

My Presidential Address to-day has dealt mainly with distribution, pricing, and marketing topics—subjects which must occupy and continue to occupy an ever greater amount of our attention. If our efforts are successful the levelling up of our summer and winter outputs, and improvement of our load factor, will go far towards reducing the present manufacturing cost of gas with the minimum of capital expenditure at the works.

The Gas Industry has an important part to play in furthering the welfare of the community and in husbanding our natural resources. In the distribution of solid, liquid, and gaseous smokeless fuel a ready solution for the abatement of smoke is provided. The field for the expansion of our operations is almost unlimited, and the benefits accruing from the continued advance in outputs are participated in by all in the form of household comfort, industrial efficiency and a purer atmosphere.

APPENDIX.

STATEMENT No. 1.—*Financial Comparison Years ended May, 1912, and May, 1937.*

	1912.		1937.		1912.	1937.
	Per 1,000 Cu.Ft. Sold.	Per Therm Approx.	Per 1,000 Cu.Ft. Sold.	Per Therm.	Per Ton Coal Carbonized.	Per Ton Coal Carbonized.
	s. d.	d.	s. d.	d.	s. d.	s. d.
Manufacture:						
Coal	11·55	1·96	1 2·22	2·99	9 8·25	17 10·0
Less residuals ..	9·22	1·57	10·07	2·12	7 8·76	12 7·59
	2·33	0·39	4·15	0·87	1 11·49	5 2·41
Other manufacturing charges	6·66	1·13	5·80	1·22	5 7·10	7 3·33
	8·99	1·52	9·95	2·09	7 6·59	12 5·74
Distribution ..	3·98	0·68	5·79	1·22	3 4·05	7 3·18
Administration ..	1·33	0·23	2·25	0·47	1 1·38	2 9·89
Rent, rates and insurance ..	2·26	0·38	2·26	0·48	1 10·69	2 10·04
Pensions and allowances ..	0·62	0·11	0·74	0·16	6·16	11·11
Miscellaneous ..	0·09	0·01	0·12	0·02	0·97	1·79
Gross cost of gas	1 5·27	2·93	1 9·11	4·44	14 5·84	26 5·75
Less miscellaneous revenue	1·71	0·29	0·91	0·19	1 5·21	1 1·73
	1 3·56	2·64	1 8·20	4·25	13 0·63	25 4·02
Add:						
Interest ..	9·76	1·66	1·93	0·41	8 2·28	2 5·01
Income tax ..	0·50	0·09	1·62	0·34	5·07	2 0·36
Sinking fund ..	4·30	0·73	3·74	0·79	3 7·30	4 8·27
Cost of gas ..	2 6·12	5·12	2 3·49	5·79	25 3·28	34 5·66
Revenue from gas	2 7·28	5·30	2 5·31	6·17	26 2·89	36 9·09

STATEMENT No. 2.—*Comparative Statistics—Years ended May, 1912, and May, 1937.*

	1912.	1937.
Coal carbonized, tons	175,353	252,881
Gas made, 1,000 cu.ft.	2,004,083	4,088,853
Carburetted water gas, per cent.	6·4	1·2
Illuminating power, candles	16·96	—
Calorific value, B.Th.U.	588·0	476·0
Therms per ton (coal gas only)	62·9	76·0
,, ,, (mixed gas)	67·2	77·1
Coke and breeze produced, tons	108,167	166,058
,, ,, ,, per ton of coal, cwt.	12·34	13·13
,, ,, used, tons	45,810	44,980
,, ,, sold or available, tons	62,367	121,078
,, ,, ,, ,, per ton of coal, cwt.	7·11	9·57
Tar produced, tons	10,294	18,614
,, ,, per ton coal carbonized, gal.	12·3	15·4
Number of Employees:—		
Manufacture	525	380
Distribution	178	454
Staff	103	204
	s. d.	s. d.
Wages of stoker per shift	5 4	10 8·8
,, labourer per hour	5·5	1 1·84
,, gasfitter per hour	8·0	1 4·5
Capital expenditure	£2,245,135	£3,226,775
,, outstanding	£1,922,149	£905,918
,, redeemed	£322,986	£2,320,857
,, outstanding per million sold	£1,020	£235

Discussion.

Mr. R. W. COWIE (Hawick) said the Address was full of points for discussion. He wished to say a word regarding the question of affiliation with the Institution, which Mr. Melvin had mentioned. That subject had been dealt with six or seven years ago by Mr. Jamieson, of Edinburgh, and he thought the matter had received its quietus. He hoped they would hear no more about it. In the Waverley Association they prided themselves on their individuality and informality and even insularity. They invited all their members, ordinary and extraordinary, to take part in their discussions. He did not think any member, except their President, favoured affiliation.

Mr. JAMES BELL (Dumbarton) said he was amused at Mr. Cowie's remarks. Affiliation would not change the character or constitution or procedure of the Waverley Association. It would be to their advantage to be represented on the Council of the Institution. Regarding the Address of the President, he himself had commenced his career in 1897 in Portobello, and it was interesting to hear of the developments in Edinburgh during the last forty years. Regarding the suggestion that the coal industry was retarding the Gas Industry, he felt this was a short-sighted policy on the part of the coal owners. The Gas Industry needed two tons of coal annually to supply gas to each individual consumer. In some districts more was needed, as, for example, in Helensburgh. The coal industry would be better employed in co-operating with the Gas Industry and in developing the output of gas. In his own undertaking the coal bill had gone up by 100% in 15 years. He saw no benefit to the coalmasters in hindering the development of gas. In Dumbarton they had introduced a simple block scheme which had proved of advantage to consumers. They gave 7,000 cu.ft. per quarter for 2s. 6d. with a drop of 10d. thereafter up to 50,000 cu.ft. and a smaller drop thereafter. It met the needs of all consumers and they did not require a two-part tariff.

Mr. DAVID FULTON (Helensburgh) said he would like to know if cannel coal was being mined in any quantity and if Edinburgh Corporation was using it to any extent. If so, at what cost did they use it as compared with bituminous fuel? The coalmasters' vision was obscured by quota and other questions. They had shown cowardice in not tackling the question of cleaning their fuel. In regard to sales, Edinburgh had shown that well directed propaganda brought good results. Their Industry must develop along the lines of high pressure distribution. Low pressure systems were beset by many troubles. They were entitled to feel nervous regarding the future of coke sales. They should avoid price-cutting, which meant no increase in business.

Mr. R. COWIE, Junr. (Hawick), complained that the Gas Industry had not yet tackled the sales question in the same way as it had dealt with its engineering problems. Edinburgh had done well, but, generally, the Salesmen's Circles had not been supported by the Industry. Salesmen should be properly equipped.

Mr. MELVIN, replying to the discussion, said that affiliation had been mentioned but no decision would be taken on this matter unless by the members as a whole. Regarding cannel, they carbonized 10,000 tons annually at Granton Gas-Works. The cost was 10% more than bituminous coal from the same area. More seams were available, but the coalmasters would not develop these till they knew there was a market available. In spite of their propaganda in Edinburgh they felt that the load per consumer was too low and they were searching for ways and means to increase it. With reference to coke prices, there had been talk of a coke marketing association, but nothing had been done. A period of price-cutting seemed in store for them unless they got together.

Mr. W. B. MCLUSKY (Halifax) said that, with regard to the block tariff, they had to remember that perhaps one-third of their customers would derive no benefit if they fixed the primary quantity at a high level. To make it useful to the small consumer they would have to make the first block about 2,000 cu.ft. per quarter. At a certain undertaking the blocks were fixed at 3s. 9d. for the first 2,000 cu.ft., 3s. for the next 1,000 cu.ft., and 1s. 4d. for all in excess, giving an average of 2s. 11d. for 4,000 cu.ft. If he offered a two-part tariff to a small consumer at 1s. 3d. per 1,000 cu.ft. for 2,000 cu.ft. provided he paid 6s. 6d. per quarter, it meant that his 2,000 cu.ft. cost him 4s. 6d. per 1,000 cu.ft. A quarterly rental might be paid by 10% of the consumers in every town, but a block scale, if not too high, would be useful to the other 90%. In Dumbarton and Helensburgh and Edinburgh the price for the first quantity was low. Most of them needed small blocks for small consumers.

Combining Gas and Electricity Services

The Institute of Municipal Treasurers and Accountants held its Annual Conference in Southport last week and one of the Papers presented dealt with the Government's electricity distribution proposals and the comments made in the McGowan Report with regard to placing electricity and gas supply under one control. The Author of the Paper on this subject was Mr. Sydney Larkin (City Treasurer, Cardiff), who made some strong criticisms of the proposals in the McGowan Report as they affect municipal electricity undertakings and received unanimous support from the Conference. After discussing the purely electrical side of the proposals, Mr. Larkin dealt with the possibility of combining municipally owned gas and electricity undertakings, and said that on one point at least the Committee was absolutely wrong, without any reasonable doubt, and that was on the question of co-ordination of gas and electricity supplies where the two undertakings were under the same control. The trouble here was, as always, fundamental, and dated back to the neglect of local authorities and others concerned to see the importance of combination of the services. He did not blame them unduly except by reiterating that the same mistake had not been made on the Continent. Neither could it be retorted that such an action would necessarily have retarded the development of electricity because the stage of development on the Continent was not appreciably behind development here. In those Continental countries which he had visited they were in front of us.

The problem was one which had still to be faced. The amount of capital invested in the Gas Industry was very great. The outstanding loan debt in respect of gas supply in county boroughs alone was about £16,000,000. Either this Industry was worthy of maintenance or it was not. If it were to be maintained, it could not be left to the mere chance of the result of competition when it might be found at the time of the country's greatest need of the products of the Gas Industry that it had been so crippled that those products were not forthcoming. If the Industry was not to be maintained, then its liquidation must be accomplished in as scientific and orderly a manner as possible without imposing too great a burden on the ratepayers.

Apart from the very obvious common services such as meter reading and accountancy which could be carried out jointly, there were several important functions connected with selling policy which should also be considered jointly. It was possible that a common fixed charge could be made for gas and electricity supplies so that the gas and electricity actually consumed might be supplied at a comparable rate. The present position was that a consumer paid a standing charge for electricity and took all current at, say, ½d. per unit. If he were also a consumer of gas he probably paid about 8d. per therm for all gas consumed, it being presumed there was no standing charge in respect of gas. The obvious course for such a consumer was to abandon his gas supply and take more electricity. Even if he could obtain gas on a standing charge basis *plus*, say, 4d. per therm for gas consumed, it was unlikely that he would wish to pay two standing charges where one would give him all the service he required, notwithstanding the fact that he might prefer gas for certain purposes. There was, therefore, an unanswerable case for an amalgamation of the two services so that one standing charge might be paid and the running charge for electricity and gas so fixed as to give about equal value on each service. There were 40 county boroughs owning gas undertakings and 39 of them also owned electricity undertakings. It was a problem to which attention had been given in some towns but much remained to be done although not in the direction indicated by the McGowan Report.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION

(AUXILIARY SECTION)

Chairman's Address

BY

G. NEIL,

Works Engineer, Southampton Gaslight and Coke Company.

Presented at the 36th Half-Yearly Meeting of the Association, held at West Hartlepool on Friday, June 10.

THE CHAIRMAN.

After serving an engineering apprenticeship with Messrs. Swan, Hunter, and Wigham Richardson & Co., Mr. G. Neil joined the technical staff of the Walker and Wallsend Gas Company in 1922. On the amalgamation of this Undertaking with the Newcastle-upon-Tyne and Gateshead Gas Company in 1925, he became Assistant Works Manager of the Howdon Works. In 1930 he was appointed Works Manager of the Hartlepool Gas and Water Company. Five years later Mr. Neil was appointed Works Superintendent to the Southampton Gaslight and Coke Company, being promoted to his present position of Works Engineer in August, 1937.

I have taken as the main subject of this Address carbonization as practised at Southampton by the use of intermittent vertical chamber ovens, with special reference to repairs carried out on this plant.

Intermittent Vertical Chamber Ovens.

In the selection of the above plant as an extension to the existing horizontal plant, the choice was governed by the following reasons:

(1) The time available did not allow for the modernization of the existing horizontal plant with possible increase of capacity.

(2) It was vital that the available site should be so utilized that the largest possible volume of gas could be produced.

(3) The plant selected must be capable of carbonizing Durham run-of-mine coal.

(4) The coke produced should be, to a large degree, similar in character to that already being produced.

(5) The definite advantage in having flexibility in quality of gas by varying the amount of steaming.

(6) Low labour charges.

(7) Facility obtained for inspection of chambers through their complete emptying after every carbonizing period.

Description of Plant.

The plant consists of 24 vertical chambers, capable of holding a charge of approximately 3½ tons of coal each. The chambers are constructed of silica, rectangular in section, 10 ft. by 12½ in. at the base, tapering 4½ in. on both major and minor axis, and 21 ft. high.

The bench is divided into units of six chambers, each setting being complete with internal producer and recuperator. The combustion flues are baffled and dampered, thus enabling the chamber wall temperature to be properly graduated.

The settings are divided by straight joints which provide facilities for letting down without affecting the adjacent settings.

The bench is suitably braced, the buckstays being tied by means of water cooled tie-bars which pass through the main division wall of each setting. The cooling water is piped to the feed tank of the waste heat boiler and reaches a temperature of approximately 130° F.

Insulation of the front wall of the bench is obtained by means of applied lagging. Experience has since proved that insulation bricks incorporated in the wall would have been more satisfactory, it being found that on letting down the plant for repairs the applied lagging loosens from the wall.

The main outlet of the gas is through the top offtakes fitted to each chamber and sealing off during discharge is accomplished by means of a dish type valve. There is also a bottom offtake provided which, in conjunction with a dip pipe and hydraulic main, gives an outlet for the gas in the lower portion of the chamber when pressure develops to the extent of overcoming the seal.

Steam is introduced into the chamber through ports in the base plate castings, the regulation of the flow being obtained by means of orifice plates and variation of the pressure by the reducing valve.

While steaming of the charge is in progress the bottom offtakes are shut off by means of a butterfly valve. The gas from the bottom hydraulic main passes through two vertical pipes to the top collecting main.

The top offtakes and collecting main are fitted with liquor sprays through which a circulation of 6,000 gallons per hour of warm liquor is made at a pressure of 40 lb. per sq.in. All liquor and tar returns via the bottom hydraulic main to a circulating tank where separation of the tar is made and where there is suitable provision for filtering the liquor.

All gas leaving the plant passes from the top collecting main through an "Arca" regulator and at a temperature of approximately 185° F.

The producer extends the full height of the setting thus ensuring an ample reserve of coke equal to approximately 48 hours' consumption.

One waste heat boiler is provided and is situated on the charging platform, thus receiving the constant supervision of the top man whose duties confine him to this part of the plant. It is of the horizontal multi-tubular, fire tube type, the capacity being 5,400 lb. of superheated steam per hour. It is designed for a working pressure of 150 lb. per sq.in.

Operation of the Plant.

Considerable flexibility is obtainable in operation of the plant, with consequent variation of coal throughput and quality of gas produced. Lack of facilities, however, for isolating the gas from that produced in the horizontal plant does not make it possible for me to give any data of actual tests carried out. We have, nevertheless, been able to arrive at fairly accurate figures by assuming a constant thermal yield per ton from the horizontal plant, determined by large scale

tests made when that plant only was producing. We have proved from time to time that the weight of coal charged into a chamber is 3·6 tons when carbonizing run-of-mine coal, and this figure is used for all calculations. Various schedules of charging have been tried as altered conditions in production have warranted, but it has been found most suitable to operate on a regular cycle.

During the earlier part of the life of the plant a 13-hour cycle was operated, which included three hours' steaming, and by a method of backward rotation allowed for two chambers to be scurfed 12 hours per day. The chambers due were discharged at 5 a.m. and 5.30 a.m. and each chamber was scurfed once in every twelve days. On the above system the coal throughput of the plant amounted to approximately 150 tons per day, the steam used for water gas production was 7% of the weight of the coal carbonized, and gas leaving the plant averaged 520 B.Th.U. per cu.ft.

Carbonizing under these conditions heats were maintained at an average temperature of 1,320° C. at the bottom and 950° C. at the top of the combustion flues, and the amount of coke used in the producers was 14 lb. per 100 lb. of coal carbonized.

Labour Requirements.

Three men per shift are required to attend to the normal duties in operating the plant. The leading stoker or topman is responsible to the shift foreman for the working of the plant. He attends to all duties on the charging floor, which include charging of chambers, feeding producers, cleaning offtake pipes and liquor sprays, regulation of gas pull, and attention to waste heat boiler.

The second shift man is the bottom man, whose duties include operation of steaming valves, opening and closing bottom doors of chambers, driving electric tractor for moving hot coke skip, and quenching, hoisting, and discharge of coke on to the wharf.

The principal duty of the remaining shift man is to clean the producers thoroughly once per shift. Each producer contains three sections of step-grate and by the method adopted one section of each fire is cleaned per round. Further duties of this man include the regulation of producer venturi steam, chimney pull, and liquor circulating pumps. Each shiftman attends to the sweeping up of that part of the plant his duties cover. A day worker is supplied to keep other parts of the plant clean, and attend to greasing where necessary. A daily inspection by skilled mechanics covers all mechanical, electrical, and steam plant, for it is essential that any stoppages required for necessary repairs should be arranged in advance, thus ensuring minimum disturbance to the regular working of the plant.

Having detailed the duties of the operatives employed in working the plant, it should be mentioned that the design reduces to a minimum the difficulties which usually arise through the shortcomings of those employed in such work. For example, regular charges are easily obtained by the type of machine used, and facilities are provided in adjustable chutes for increasing or decreasing the volume of coal should variation take place. Given reasonable attention, the sprays used in the liquor circulation system fitted to the collecting mains have been found to keep this part of the plant free from stoppages, the gas being allowed to flow freely from the chambers at the required pull. An efficient sealing of the charging hole lids is obtained by using a slurry of clay, bottom doors are easily cleaned, ample adjustment being allowed for, and little difficulty is found in maintaining a general gas-tightness.

The producers are of ample capacity and include for a large reserve of fuel which ensures an even depth in the portion actually employed in the production of gas. A cool fuel bed is obtained by a steam supply specially fitted for that purpose, which is augmented by the primary air venturi steam, thus ensuring the minimum formation of clinker.

Generally speaking, the plant is simple in its operation and is, in the Author's opinion, an efficient carbonizing unit. However, it should be pointed out that careful technical control is essential if the best results are to be maintained. A special feature of the plant is the system for heating the chambers. Careful control is required, and a daily routine has been instituted which includes taking the top and bottom flue temperatures by pyrometer. The readings are logged, as also are any adjustments to dampers, &c., which may have been necessary.

In practice it is found that a shortage of producer gas due to poor quality of fuel has, through the method of distribution, an immediate effect on the combustion flues of the settings. When this situation develops the long flame necessary to supply the heat to the upper portion of the chamber is lost through the replacement of the gas by secondary air, and a short flame produced which results in uneven heating of the chamber. As even heating is most desirable from the point of view of both the working and the ultimate life of the chamber it is necessary to provide an ample supply of producer gas of uniform quality. It is, therefore, our policy to feed good, clean fuel to the producer.

A further point which has affected our decision in this matter and has had a very important bearing on the history of the plant has been difficulty encountered in keeping particles of fine ash from passing forward from the producers into the combustion flues. The condition in the combustion flue quickly converts the ash to a molten state and a gradual accumulation takes place on the floor of the chamber. The significance of this will be appreciated when the possible effect of molten ash on refractory materials is borne in mind. This effect has been suspected of playing a considerable part in the inward bulging of the chamber walls which gradually took place at approximately the level of the floor of the combustion flue. Although slow in developing, this bulging finally interfered with the working of the plant to such an extent as to reduce the output. The cancelling of the taper on the minor axis through this defect caused numerous charges to "hang up" when the bottom doors were opened for discharging. Although this was counteracted by using light rods with poker ends, so designed as to eliminate possible danger of damage to the silica when being used, it was found that the more seriously affected chambers were becoming increasingly difficult to empty.

A consultation with the designers of the plant resulted in a decision being made to let down one of the settings consisting of six of the twenty-four chambers, a definite plan having been formulated whereby it was hoped to overcome the defect.

(To be concluded.)

Whessoe Foundry and Engineering Company, Ltd.

The annual report of the Directors of the Whessoe Foundry and Engineering Company, Ltd., which will be submitted at the eighteenth annual general meeting to be held on Friday, states the profit for the year, including interest and net profit on investments realized, amounted to £138,198, from which there falls to be deducted depreciation on land, buildings, plant, and machinery, £5,829; Directors' fees, including income-tax thereon, £2,297; Welfare Schemes and Provident Funds, £1,283; provision for bonus to staff and workmen, £5,000; and provision for taxation, £39,925 —£54,334, leaving an unappropriated surplus for the year of £83,864, to which must be added the amount brought forward from previous year (after payment of dividend and Directors' commission on profits), £9,889, making a total of £93,753. Out of this sum the Directors have transferred to General Reserve £25,000 and recommend the payment of a dividend of 30% (less income-tax at 5s. 6d. per £) requiring £43,500, leaving to be carried forward (subject to Directors' commission on profits) £25,253. The year under review was one of exceptional activity, and the Company's production reached a record figure. This, coupled with the increased efficiency of the works, has resulted in the profits shown by the accounts. The policy followed by the Company for widening the field of its products has resulted in an increasing number of orders for cleaning plants for industrial gases, and steady progress has also been made in the development of electric-arc welding as applied to constructional work of all types. In order to cope with the resulting increase of work a new welding shop of ample capacity is in course of erection. During the year the Weighing Machine Department was sold to another Company on satisfactory terms; the portion of the price applicable to goodwill, £5,000, was carried to capital reserve account and has been applied in writing off additional depreciation and providing for the demolition of the old welding shop.

INSTITUTION OF GAS ENGINEERS

ANNUAL MEETING, May 31 and June 1 to 3

WRITTEN CONTRIBUTIONS AND REPLIES TO THE DISCUSSIONS

In this Third Institution Number of the "JOURNAL" we publish the written contributions to the discussions together with the Authors' replies as far as they are available at the time of going to press. The remaining replies will be published subsequently.

Considerations Upon the Processing of Coal

Communication No. 180

by

E. V. EVANS, O.B.E., F.I.C., M.Inst.Gas E.

(Chairman, Research Executive Committee, Institution of Gas Engineers)

Mr. F. H. ROBINSON (Bishop's Stortford) wrote: The remarks in Section 5, on existing complete Gasification Processes, prompt me to refer to the complete gasification plant which I worked at Harrogate from 1920 to 1927.

Some of you may remember that this plant consists of a setting of horizontal retorts combined with a water gas generator in one arch. After carbonization, the hot coke was discharged direct into the generator. The whole plant was automatic in operation except for charging and clinkering.

In this plant the "blow" gases circulated round the retorts and carbonized the coal. When the cycle was changed, the hot water gas passed through the retorts and thus assisted still further the carbonization of the coal by direct contact, exactly as Mr. Evans says should be done. Further, the hot coke was discharged direct into the generator without the usual intermediate quenching. The carbon monoxide content varied from 17 to 26 per cent.

From experience it was found that when the plant was worked to a balance so that no surplus coke was available and, on the other hand, no additional coke was required for the generator, the gas produced amounted to 180 therms per ton and averaged about 380 B.Th.U. per cu.ft., as against the figure of 360 B.Th.U. quoted by Mr. Evans for a two-stage process. When producing gas of 425·5 B.Th.U. and having a little surplus coke available, an efficiency of 74·02 per cent. was obtained or a net efficiency of 62·5 per cent. after allowing for steam and electricity for blowing. When a lower quality of 279 B.Th.U. was produced as a diluent for the coal gas an efficiency of 87·7 per cent. was obtained, or a net efficiency of 75·2 per cent. after allowing for steam and electricity. To obtain the last result a quantity of the "blow" gas was drawn in. There was little scope for increasing the heat efficiency still further by utilizing the waste gases as the temperature of these only reached 475° C. at the end of the "blow."

So far as my experience goes, complete gasification without any other residuals but tar and liquor means making a gas of 380 B.Th.U. per cu.ft., which is clearly too low for our present conditions. It can, of course, be used as a diluent, but it is still necessary to have a background of straight coal gas plant unless the researches referred to in the Paper result in our being able to gasify the whole of the tar to enrich the gas up to a 500 B.Th.U. standard. At present complete gasification is useful as an auxiliary but not as the main gas making plant. This was realized when the extension of the Company's area in 1928 necessitated additional gas making plant. It was essential to provide extra coal gas plant to carry the main load and as the only suitable site on which to erect new vertical retorts was that occupied by the complete gasification plant, the latter had to be removed after seven years' continuous use.

Carbonization from a Plant Designer's Viewpoint

Communication No. 181

by

F. B. RICHARDS, M.B.E., M.Inst.C.E., M.I.Mech.E., M.Inst.Gas E.

(Chairman of the Woodall-Duckham Companies, London)

Mr. JAMES JAMIESON (Edinburgh) wrote: I am pleased to contribute to the Discussion on this Paper for two reasons. It is brimful of information of the utmost value to our Industry and it illustrates how much we are indebted to plant designers for the favourable competitive position we to-day enjoy. I have been associated with Mr. Richards and his colleagues in a number of technical investigations on the carbonization of coal, and this Paper is characteristic of their thoroughness. It is a well-balanced review not only of design but of the more complex problem, the scientific treatment of coal. One can see the hand of the architect, the engineer, the technician, and the chemist operating as a team, which is a sound foundation on which to build and the surest road to ultimate success. I agree with Mr. Richards that benzole washing has again brought into prominence high quality gas and that 550 B.Th.U. gas can be produced in continuous vertical retorts. but I seriously suggest that to do so is wrong in principle and is not in keeping with good carbonization procedure.

High quality gas can only be produced in continuous vertical retorts with a packed charge and with the minimum of steam. The packing can be accomplished in two

ways—by the use of strongly-caking coals or by the introduction of a substantial quantity of smalls when carbonizing weekly-caking coals.

In each case the easy and natural travel of the coal is impeded and leakage accompanied by loss in efficiency results. Take the case of the low-caking coals which are commonly used for gas manufacture in Scotland. This type of coal produces ideal operating conditions with a very high process efficiency. In my opinion it was for coals of this class that continuous vertical retorts were designed. That may not have been the intention but I do suggest it has worked out that way. But it has done more; it has forced down, and in many cases to a very low level, the quality of gas produced. Continuous vertical retorts are practically standard equipment in Gas Works of any size in Scotland to-day and their popularity, I feel certain, is due entirely to the suitability of Scottish coal.

In a Paper which I presented to the North British Association of Gas Managers in 1932, entitled "Calorific values and their relation to working costs and results," I examined production costs of different qualities of gas from 400 B.Th.U. to 500 B.Th.U. and was forced to the conclusion that with Scottish coal at any rate the most economic quality to produce in continuous vertical retorts was round about 450 B.Th.U. Nothing has happened in the interval to alter my views. To force the quality higher either with the object of increasing benzole production or indeed for any other purpose must in the long run mean a more expensive therm. For that reason I suggest that if maximum benzole recovery is desirable the coal should be treated in plant other than continuous vertical retorts.

I agree with Mr. Richards that from a plant designers' point of view vertical retorts have considerable flexibility; indeed, I know of no other carbonizing plant where the range is so great. I have already mentioned that we produced gas of 400, 425, 450, 475 and 500 B.Th.U. in the same retorts, the throughput of coal per day varying from 5·84 tons to 8·85 tons, the cu.ft. of gas per retort per day from 178,762 to 143,278, and therms per retort per day were 716·5 in the case of 400 quality and 717·7 in the case of 500 quality, while the coke produced per ton of coal carbonized varied from 10·1 cwt. to 11·87 cwt. These are striking figures and fully support the views expressed by Mr. Richards.

To utilize that flexibility, however, by disturbing the smooth working condition in order to supplement the normal output is a practice which should only be resorted to in an extreme emergency. The strongest recommendation for continuous vertical retorts is the constancy of operation. With a constant quality of coal adjustments only need be made on the rarest of occasions. There are much cheaper and certainly more expedient ways of augmenting output than by taking advantage of flexibility in continuous vertical retorts.

In connexion with the testing of coal I agree with Mr. Richards that the percentage of volatile matter is no guide at all to the gas making qualities of coal and for that reason I am surprised that it should often be used for that purpose. Only recently, when discussing coal with a number of my colleagues, I found proximate analysis and particularly volatile matter referred to time and again and arguments put forward for assessment of coal on that basis. After a long experience in coal testing I have come to the conclusion that the only reliable way in which coals can be assessed is by carbonizing a large quantity under actual working conditions. It was for this reason, when erecting our vertical retorts, that we arranged a complete oven from which the gas could be taken and measured along with the other products. That plant has paid for itself many times over, not only for assessment but in keeping actual deliveries up to scratch so far as quality is concerned.

We have used the swelling test for a number of years and we have found it very useful for forecasting the behaviour of different coals in carbonization. It is also useful for assessing proportions of coals for constituting blends, and the percentage of each necessary to form coherent coke is readily and easily determined. This test was of particular value to us during the coal strike in 1926 when Silesian coals of very low or non-caking quality had to be blended with American high-caking coals, difficult in themselves to carbonize, and decisions had to be made at short notice on account of irregularity and scarcity of supplies. It has also been found useful when using coke breeze with highly-caking smalls and on few occasions have we had trouble with the retorts when mixtures based on this swelling test have been carbonized.

With regard to coal and coke handling plant I was particularly interested in the remarks made by Mr. Richards on gravity bucket elevators, as a very large installation was installed with our original vertical retorts at Granton. One pair of conveyors deals with coal and coke and the other pair with coke only. A careful note was kept of maintenance costs and over a period of 6 years the undernoted was the comparison:

—	A and B.	C and D.
1	2	3
Material handled	Coal and coke	Coke
Length of chain, ft. each	510	230
Number of buckets, each	390	166
Coal handled, tons	1,130,588	—
Coke handled, tons	580,600	423,200
Total coal and coke handled, tons	1,711,188	423,200
Cost of maintenance, pence per ton	0·715	1·3
Cost of maintenance, £ per 100 ft. of chain	1,000	1,000
Weight handled, tons per ft. length of chain	3,350	1,840

It will be noted that the cost per 100 ft. length of chain for the conveyor doing the dual work is £1,000, representing 0·715d. per ton handled, and for the other, dealing with coke alone, £1,000, or 1·3d. per ton. The maintenance costs have increased materially and where at all possible now gravity bucket conveyors are used to the least extent possible for the handling of coke, preference being given to band conveyors which are undoubtedly the cheapest from a maintenance point of view.

I am sorry that Mr. Richards, when discussing architecture of retort houses, has omitted to refer to the excellence of the design and architecture of the building erected as long ago as 1900 by W. R. Herring, who was responsible for the Works at Edinburgh. I am of the opinion that these buildings were probably the first step in introducing originality in the designs of retort houses and Gas Works generally. While the buildings were expensive the cost of upkeep has been low and on that account the expenditure has been fully justified. Although these retort houses had to be heightened to accommodate vertical retorts the alterations carried out did not in any way affect the appearance; in fact it has, if anything, improved their proportion and they form a very fine example of adaption and continuation of the original architectural features.

Value of Laboratory Assay.

Mr. P. C. GARDINER (Tottenham) wrote: In making these few observations on his Paper I would like to add my personal thanks to Mr. Richards, particularly for those sections which constitute such an interesting and instructive contribution to the subject of coal testing. In this connexion I am pleased to be able to say that seven years' experience at Tottenham has convinced me that Mr. Richards's confidence in the results from a laboratory assay in competent hands is quite well founded.

Reference is made to a rapid method of calculating the oxygen content of coals from the results of the tube tests as well as to the relationships which have been established between the oxygen in the coal and the carbon monoxide in the gas evolved. It is therefore interesting to be able to record that a similar calculation is regularly made from the results of the Gray-King assay at Tottenham and I can definitely confirm the reliability of this method for the determination of oxygen. General correlation between the volatile oxygen content and carbon monoxide in the gas has also been observed. In the cases of some coals of low oxygen content the agreement has been found to be marked, but our results do not confirm that the same relationship applied generally. In this connexion I should like to ask Mr. Richards why, in his computation of volatile oxygen no account has been taken of the oxygen in the tar. Dry tar usually contains about 5 per cent. of oxygen

and this would represent from 0·2 to 0·3 per cent. on the weight of coal.

Another point to which I should like to refer is that the oxygen content calculated from our assay results is found to be rather higher than the published figures for oxygen on the same coal. These published figures are presumably calculated, by difference, from the ultimate analysis and it would be interesting if Mr. Richards could give the comparison between his calculated figures and those obtained in the ordinary way from the ultimate analysis.

The degrading effect of oxygen on the volatile matter referred to deserves serious attention and the rather ingenious method of calculating the thermic yield from the volatile matter and oxygen is worthy of further investigation. At first sight, however, it would appear that the volatile matter, after correction for oxygen, should be a gauge of the total gaseous therms (including benzole), whereas, according to the formula given, it is the debenzolized thermic yield which is ascertained.

The loss of 2 therms per ton is referred to as the result of the addition of 0·5 per cent. of oxygen to the purifiers, but this statement is acceptable only if the calorific value of the final gas is constant, and I have no doubt Mr. Richards will agree with this qualification.

Pexton's yardstick is also mentioned, and as a gauge of the efficiency of hydrocarbon extraction it is very valuable, but, as the Author indicates, it is not a gauge of economy in gas production.

In the carbonization of Durham washed coals (9 per cent. ash and moisture) in intermittent vertical chambers at Tottenham, H.E. Values ranging from 37 to 40 are regularly attained. Does Mr. Richards consider that coal washing can account for so great a difference between these figures and those quoted in the Paper for run-of-mine coals?

Desirability of Cleaner Conditions.

Mr. F. Greenhalgh (Oldham) wrote: I was, I regret, unable to be present when Mr. Richards read his Paper, but I understand that several members contributing to the discussion mentioned the desirability of cleaner conditions in the retort house and on the Works generally.

In the reconstruction of our Higginshaw Works some five years ago, particular attention was paid to the design of the various buildings, and I think they were at that time something of an advance on Gas Works architecture in general. In preparing the scheme, however, we had made no special provision for improved cleanliness, and, a few months after the plant had been started up, I realized that if conditions were to be maintained in reasonable accord with the standard of architectural work something would have to be done. At my suggestion, our Gas Works Committee therefore agreed to instal a dust collecting plant with dust hoods to various tipping points in the retort house and facilities for putting the retort discharge castings under suction. We also installed a fixed vacuum cleaning plant with piping and numerous collection points in the various buildings. These provisions could, no doubt, be further extended and conditions further improved. However, the general appearance of the Works and its clean and comparatively dust-free conditions have been frequently commented upon, but apart altogether from appearances—which, of course, have a value—I am satisfied that the expenditure in this direction has been fully justified in lower maintenance costs.

I wish to congratulate Mr. Richards on a Paper full of careful thought for detail.

Co-operation Between Client and Contractor.

Mr. A. H. Lymn wrote: Appreciation of Mr. Richards's unique Paper and congratulations thereon, after the remarks of the previous speakers, are almost redundant, but they are sincere.

It has always been my experience that in technical matters the best results are obtained when the maximum co-operation prevails between client and contractor. Consequently, this admirable Paper is to be welcomed as promoting general understanding between the two. The Author has dealt very aptly with the point to which he refers, of giving a non-advertising paper by presenting the contractors' side so generally that it could apply to all contractors in the carbonizing business, but in so doing he has not left much to criticize or to add. Nevertheless, he has perhaps not been as catholic as he might have been; for example, he includes very little matter in regard to horizontal retorts.

As one who is engaged in the business of design and construction of both continuous and intermittent vertical retorts, as well as coke ovens, I heartily welcome Mr. Richards's contribution. He has very ably and comprehensively given expression to all those things which come more or less naturally to and are taken in their stride by experienced contractors. It is, however, probable that until we saw all this in print not even the contractors themselves realized how much is involved in their everyday work. I agree with the Author on the principle that each project should be considered on its merits, and that generalizations as to type of plant are dangerous. There is from time to time a tendency for a particular type to become "fashionable," but carbonizing fashions are no more universally suited to all cases than are feminine fashions to every feminine figure.

A point I should like to touch upon is the plant designer's continual struggle to keep down the cost of his plant and at the same time provide the facilities and equipment that he considers the operating engineer should enjoy. This is a fight which is always being waged by plant designers, though it is probably not so prominently in the minds of engineers, and I would like to take this opportunity of stressing the fact that for obvious reasons no plant designer wishes his plant to cost more than it need.

I do not see eye to eye with Mr. Richards when he says, "broadly speaking the volume of gas made per chamber per day remains constant irrespective of calorific value." In my view, when steaming and water gas making is added, the volume of gas per unit of time varies considerably. For example, it has been found with intermittent vertical chamber plant, as at present dimensioned, that the average coal gas make during distillation is in the region of 1,100 to 1,300 cu.ft. per ton per hr., while water gas making can proceed at the rate of 2,000 cu.ft. and upwards per ton per hr. Consequently, it seems clear that prolonging the steaming period will increase the volume of gas made per chamber per day. The calorific value of the total gas will, of course, be considerably reduced, but this can be countered by a recently-developed process in successful operation in Canada. I refer to that invented and applied by John Keillor, of Vancouver. In this process the steaming is prolonged to any desired extent, limited of course by coke yield and quality, and the resulting gas is carburetted in the chamber itself to bring the calorific value up to the desired figure. Including gas derived from the carburetting medium, the volume produced per chamber per day has been increased by 20 per cent. above that which could be obtained with normal steaming and as the calorific value of the total gas has been maintained the actual gaseous thermal output of each chamber has been increased in the same proportion.

Incidentally, it might be added that this process has provided great flexibility in the coke and gas yields, to follow market fluctuations by enabling the production of more gas and less coke from a ton of coal to meet either a poor coke market or a higher gas demand.

Local Amenities.

With regard to local amenities, the emission of fume is a function of the coal carbonized in any plant, other than continuous vertical retorts, the better claims of which for cleanliness over those of intermittent vertical chambers are not so marked if the latter are provided with a suitable design of charging car. This difference becomes negligible when washed coal is used.

Although at the end of his Paper the Author mentions "improved methods of coke quenching" among developments which are engaging the attention of the Gas Industry, he is somewhat inconsistent in dismissing the important subject of coke dry cooling with less than two lines under "Local Amenities." Several types of dry cooling plant

are in successful use in this and other countries. One of these about which I can speak with knowledge produces a dry constant quality coke more resistant to abrasion than wet quenched coke and consequently giving less breeze, while raising 600 to 900 lb. of steam per ton of coke. Engineers may certainly with advantage give serious consideration to dry cooling their coke.

I am in general agreement with Mr. Richards in his conclusions regarding economic considerations. He seems, however, to have omitted the important question of the availability and price of coals having different carbonizing characteristics. It seems to me that in these days it is essential to have as wide a market as possible from which one can pick and choose. It is obvious that if a plant can carbonize washed slacks costing some shillings per ton less than nuts of the same quality here is indeed an economic consideration of paramount importance.

Another point upon which I would comment is his statement that, owing to the greater charge weight of Durham coals as compared with Yorkshire coals, an intermittent vertical chamber plant produces more gas per day with the former coals. This statement presupposes the same carbonizing time in both cases. It has, however, been my experience that, other things being equal, the carbonizing time is largely a function of the bulk density, and that the lower the density of the charge the shorter the carbonizing time. This means that, given coal of similar gas making qualities, there need be no reduction in gas output when changing from coals of high to those of low bulk density. This, of course, affects Table 3 in so far as the capital cost given per therm per day is too high for Yorkshire coals.

With regard to the section "Fuel Economy on Carbonizing Plants," there is little to add or criticize in Mr. Richards's comprehensive statement. Although science generally tells us to carry through every process as completely and efficiently as possible, economic considerations cause us to consider the whole combination of processes involved on a Works. Having this view, the non-recuperative setting is cheaper in capital outlay, while the Gas Works taken as a whole can operate more cheaply, always provided that the steam can be satisfactorily utilized, a state of affairs which frequently does not exist.

Where the Author deals with carbonizing plants heated by clean cold producer gas from mechanical producers, he is correct in his views that, despite the lower maintenance costs, experience in this country has shown that such plants are not generally a paying proposition, although I rather think he has omitted to give that system the credit of the steam which in a modern producer gas plant of that type is raised by cooling the gas. Where, however, the ash in the coal is very high, as, for example, in some Canadian coals, the mechanical producer gas plant greatly improves the economic utilization of these coals in Gas Works.

Effect of Inerts.

Mr. J. R. Owen (Gas Light and Coke Company) wrote: I should like to place on record my appreciation of this excellent Paper.

Of particular interest is the reference to the effect of inerts upon the efficiency of the carbonizing results. I should, however, prefer to measure added air in terms of nitrogen rather than oxygen, as the nitrogen remains unaffected by the purification process.

Much may be discovered regarding the efficiency of both the carbonizing and the purification processes by ascertaining the quantity of nitrogen in a few daily samples of gas taken concurrently on the outlet of retort house, and on the outlet of purifiers. A fairly good nitrogen figure in the outlet retort house gas is about 3 per cent.; allowing 3 per cent. added air for purification, *i.e.*, 2·4 per cent. nitrogen, we should have approximately 5·4 per cent. nitrogen on the outlet purifiers.

As an example of the effect of inerts, let us consider a works of the following proportions:

Coal carbonized per day, tons	680
Total gas made, cu.ft.	10,000,000
Calorific value, B.Th.U. per cu.ft.	520
Total therms	52,000
Therms per ton of coal	76·5

Benzole extraction of the order of 1,428 gal., or 2·1 gal. per ton of coal, reduces the calorific value of the final gas to 500 B.Th.U.

If the inerts in the gas could be reduced by 1 per cent. only, then we should have the following:

Total gas made per day, cu.ft.	9,900,000
Calorific value, B.Th.U. per cu.ft.	525·3
Total therms	52,000

This gives us 9,900,000×5·3 B.Th.U. extra for benzole, which, at 1·4 therms per gal., is equivalent to 375 gal., or 0·55 gal. per ton of coal.

If it is not possible to "strip" this extra 5·3 B.Th.U., then, where steaming is practised, the calorific value may possibly be brought down to the original 520 by extra steaming. Taking the calorific value of the water gas made as being 300 B.Th.U., we have the following:

Coal gas	9,900,000 cu.ft. at 525·3 =	52,000 therms
Water gas	236,363 cu.ft. at 300·0 =	709 therms
Total	10,136,363 cu.ft. at 520·0 =	52,709 therms

Here we get an extra 709 therms, or one therm per ton of coal. In this case it can be seen that these extra 709 therms are equivalent to:

$$\frac{709}{76{\cdot}5} = 9 \text{ tons of coal,}$$

or 1·3 per cent. of the total coal carbonized.

Summarizing we find that 1 per cent. inerts is equivalent to either:

(*a*) 0·55 gallons of benzole per ton of coal.
(*b*) 1·0 therm per ton of coal.
(*c*) 1·3 per cent. of the coal carbonized.

Breeze-Burning Producers.

Mr. H. J. Toogood (Hampton) wrote: To discuss a Paper is to appreciate it, and appreciation is an Author's best thanks.

I am pleased with the Author's Introduction, I am glad he chose his subject-matter from the field of his own activities, and I am intrigued with his explanation of the respectful silence of those members of this Institution who come from the contracting side.

The Author refers very briefly indeed to breeze-burning producers, while he says, in effect: 1s. per ton on coke sales=25 per cent. of fuel costs of carbonization, 25 per cent. capital costs of carbonization, and 75 per cent. labour costs of carbonization.

Correlating these statements, the real economy of breeze-burning producers can in part be visualized, yet the Author is surprisingly silent on this important point.

Now, following the Author's excellent lead, and quoting from my own field of work, I have recently introduced a producer, the chief characteristic being a simple composite grate which, while working, can be converted, *ad lib.*, to a step grate or a bar grate or partly step grate and partly bar grate. By this means control over the fuel under gasification can be obtained to a much greater extent, and so by preventing or reducing clinker formation, the gasification of breeze or run-of-retort coke and the more economic heating of retort-settings can be facilitated.

Hitherto many medium-sized Gas Works, though fully appreciating the economy of breeze-burning producers, hesitated to put this method into practice for considerations of adequacy of staff. I had hoped that with amalgamations, and co-operation of technical staffs of recent years this diffidence would have been overcome, and that this economy, definitely within reach, would ere now have become the accepted practice. Therefore, I ask the Author if he will extend his remarks on the economics of breeze-burning producers, and thus by encouragement, help the wavering to reap this ripe harvest, to the advantage of the Industry we all serve.

Taken as a whole I regard this Paper as a very important link in the train of progress for, since to progress we must specialize, we automatically grow up in more or less water-tight compartments; the research workers in one, the gas manufacturers in another.

This Paper clearly shows how the operation of a contractor's enthusiastic team work can provide that very

necessary factor, "the Missing Link," between the two schools of thought.

The Author's Reply.

The AUTHOR, in reply, wrote: I desire in the first place to express my appreciation of the manner in which this Paper has been received. If the volume of Discussion may be taken as a measure of the interest of members, I am indeed happy. The general tenor of the remarks encourages me to hope that the Paper may serve a useful purpose.

In attempting to reply to the various points raised, I must necessarily limit myself to those which appear to be of greater importance.

Several speakers refer to the effect of blending or mixing coals for carbonization, and I commend their remarks to the consideration of members. The experience in this regard reported by Mr. McLusky and Mr. Restall is distinctly encouraging.

In view of Sir Frederick West's remarks on the value of the small assay tests of coals, it is of interest to have the benefit of Mr. Gardiner's experience which confirms our own, namely, that in experienced hands we have found these tests to be reliable.

I would like to endorse Sir Frederick West's comment on the subject of capital costs, namely, that very great care is necessary in using the figures given in the Paper for the purpose of foretelling what might be the cost of plant at the present day. These costs are, so far as one could make them, comparative and should be regarded solely in this sense.

Several speakers refer to the subject of burning breeze in producers, and in this regard the caution indicated by Mr. Crowther tends to balance the optimism discernible in Mr. Toogood's remarks. There is perhaps no subject on which it is more dangerous to generalize, since so much depends upon the particular breeze that is available and other local circumstances. In some cases the utilization of breeze in producers has proved successful both from the technical and economic points of view; in other cases the issue is less clear. In any event, careful observation is necessary when thus utilizing breeze, to see that the working and life of the settings are not impaired thereby. Since breeze burning generally leads to increased deposition of dust in the flues of the retort settings, the fusion point of the ash becomes a matter of particular importance.

In reply to Mr. Shaw's question regarding the method of determining the fusion point of ash, I would refer him to British Standard Specification No. 453—1932: "Determination of the fusion temperature of coal ash." The method used in the Woodall-Duckham Laboratories is based upon this specification, with minor alterations of detail.

With regard to the question raised by Mr. Birks as to the effect of excess oxygen on the thermal yields of gas per ton of coal carbonized, I confirm that the loss referred to in the Paper is due to the reduction of steaming while maintaining the calorific value. This point was brought out also by Mr. Gardiner.

I note from Mr. Owen's preference for gauging the added air from the added nitrogen, but I still prefer the calculation utilizing the excess oxygen over and above that required for purification. The figures given by Mr. Owen illustrating the advantage of a reduced nitrogen content are very interesting.

Replying to Mr. Gardiner's query as to why the oxygen in the tar was not taken into account in the computation of volatile oxygen, no attempt has been made to establish an oxygen balance sheet, but it has been found that a relationship exists between the oxygen in CO_2+H_2O+CO and the thermal yield and volatile content of the coal. To allow for the oxygen content of the tar would not alter the general form of the relationship.

I am not able to give the information asked for by Mr. Gardiner for comparing the figures as calculated and those obtained in the ordinary way from the ultimate analyses. The degrading effect of oxygen on the volatile matter could be expressed as Mr. Gardiner suggests by a suitably modified formula to cover the benzolized gas. The H.E. Values referred to by Mr. Gardiner are interesting, and I do not think that the difference between these figures and those quoted in the Paper for run-of-mine coals can be accounted for simply by the fact that the coal used at Tottenham is washed.

Mr. Crowther's suggestion that plant flexibility might be sought by designing a plant capable of operating either intermittently or continuously with equal efficiency at will is interesting, and is worthy of further consideration.

I think Mr. Jamieson will find a considerable measure of agreement in his suggestion that 550 B.Th.U. gas is rather a high quality to aim at producing in continuous vertical retorts. It is probable that special circumstances alone could justify the adoption of continuous vertical retorts to produce gas of this calorific value. I think, also, that there will be general agreement with Mr. Jamieson's opinion that constancy of operation is to be desired for continuous vertical retorts, and indeed for any other carbonizing plant. In large Gas Works where the load is carried by several units of plant this ideal of constancy can be more nearly approached than in the smaller Works where the whole output is produced in one retort bench and that of comparatively small size. In such Works the ability to vary the output from continuous vertical retorts has been found useful in practice.

Mr. Whitehead's suggestion that the parity values given in the Paper be supplemented by figures to illustrate the effect of variation in price of coal is welcome.

Several speakers refer to the question of preventing the emission of dust and fumes. From this point of view continuous vertical retorts have advantages over all other carbonizing processes with which I am acquainted. Even so, the modern desire to produce dry coke has led to considerable trouble with dust in continuous vertical retort houses and I commend Mr. Greenhalgh's remarks on this subject to those who are interested in this question. The degree of cleanliness attained at Oldham is a practical illustration of what can be done and is worthy of personal inspection. In so far as intermittent vertical retorts are concerned I submit that very much less dust and smoke are emitted during charging per ton of coal charged than is the case with horizontal retorts. If anyone entertains doubt on this point I think Mr. Whitehead could probably satisfy him by actual demonstration.

Mr. Lymn's remarks in regard to the effect of steaming intermittent vertical retorts from the point of view of plant production are interesting. His experience does not agree with that of the Author. His suggestion of increasing the thermal output of intermittent vertical retorts by carburetting is also interesting.

Mr. Lymn refers to the important question of availability and price of coals having been overlooked in the Paper. A reference to page 7 will correct this impression.

Effect of Bulk Density.

In regard to the effect of bulk density upon plant output I agree with Mr. Lymn's experience that, other things being equal, the carbonizing time is largely a function of the bulk density and that the lower the density of the charge the shorter may be the carbonizing time. It is, however, not always convenient to vary the operating cycle by a small fraction of an hour and this consideration was in mind when framing the remarks on this subject contained in the Paper.

In his comment on mechanical producers Mr. Lymn suggested that credit had not been allowed for the steam which in a modern producer gas plant is raised by cooling the gas. I believe that in practice the amount of steam so raised is generally required in and about the producer installation and it is rarely that a surplus is available for sale. It is for this reason that no credit has been given to the mechanical producer plant for surplus steam.

I have been particularly interested in Mr. McLusky's summing up of the vexed question of "silica versus fireclay" for building vertical retorts. Whatever may be the result of experience from this point of view of cost of maintenance there is no doubt that the use of silica has brought about a substantial reduction in the capital cost of plant per unit of output.

Mr. Restall has expressed surprise that no reference is

made in the Paper to the vital question of producing "cheaper gas and gas only." In so far as my own views of the subject are concerned, I would refer Mr. Restall to the *Gas World*, June 4th, 1938, p. 528. From the point of view of immediate application there seems to be general agreement that the maximum revenue from coke and other by-products is to-day intimately associated with cheap gas.

With regard to the economics of auxiliary coal gas firing for retort settings, to which Mr. Restall refers, this is a matter of calculation in each individual case and no generalization is possible.

I note Mr. Rhead's suggestion in regard to the pooling of designs with a view to the improvement of plant and I await with interest the comments of others who, like myself, have to depend in no small measure upon speciality in design to earn a living!

I am indebted to Mr. Jamieson for drawing attention to the outstanding contribution of W. R. Herring to the cause of improved architecture for Gas Works when he designed the Granton Works at Edinburgh.

In conclusion I wish once again to express my great appreciation of the kind reception accorded to this Paper and particularly to those who have shown their interest by contributing so freely to the Discussion.

Coke and Its Scientific Uses

Communication No. 182

by

F. J. EATON, Ph.D., B.Sc., A.I.C.

(The Gas Light and Coke Company)

Mr. H. J. TOOGOOD (Hampton) wrote: I had hoped that some simple thermostatic control would soon be available in connexion with the existing small-sized domestic coke-fired boiler, of which there must be several hundred thousand already in use, so as to stimulate the demand for coke.

The Author rather damps this pious hope, however, remarking that thermostatic control for hand-fired boilers has been disappointing. Further, he points out that the popularity of the small domestic boiler has led to scamping in design, so that the capacity for fuel in these numerous existing domestic boilers is much too small.

Now these two factors are disconcerting, and I would ask the Author, by way of constructive criticism, if the merits of the case warrant the Gas Industry itself putting on the market a combination coke-scuttle and hopper feed, *i.e.*, a scuttle with a door at each end, which could be bought cheaply, and in use would act as a scuttle between the coke storage and the fire, and, when placed over the existing fires would

(*a*) Feed the fire more cleanly.
(*b*) Maintain greater constancy of depth of fuel.
(*c*) Increase the hourly supply of fuel.

The price should be little more than the present day cost of a scuttle, so that through increase in the use of these innumerable domestic boilers greater use may be made of our domestic fuel, coke.

Also, I am not entirely without hope that some readily attached thermostatic control will arise if only to prevent overheating or boiling of the water, thereby causing reduction in the deposit of sludge from hard water.

The Author's Reply.

Dr. F. J. EATON, in reply, wrote: I should first of all like to thank all those who have taken part in the Discussion and who have emphasized certain aspects of coke utilization which are only briefly mentioned in the Paper. Mr. Boon has directed my attention to the importance of coke marketing, while at the same time he has stressed the need for improved coke quality and more efficient appliances. I agree with him that all three are equally important and I am pleased to have the opportunity to explain that I have devoted the greater part of the Paper to the design of appliances, firstly because there is at present very little reliable information on this subject and, secondly, because a well-designed appliance can make possible a new market or hold an existing one. There are several examples of this in the Paper; the coke fire has opened up the domestic space-heating market, the gravity-feed boiler has retained, in the face of keen competition, the central heating market, while new and improved industrial uses for coke can be developed by the use of the semi-producer furnace.

I agree with Capt. Blackie that it would probably give a better indication of the quality of open fire coke reaching the consumer if each of the bi-weekly samples were tested separately instead of mixing them. The cost of testing and sampling, however, has to be taken into consideration, and the method we have adopted gives satisfactory results, having regard to the very small number of complaints received. Capt. Blackie has raised the question of the composition of the gas in the magazines of gravity-feed boilers and has also drawn attention to the importance of the fit of the magazine charging door. Recent tests show that the gas in the magazines has the same composition as that in the combustion space above the fuel bed. This is approximately 16 per cent. carbon dioxide, 5 per cent. oxygen, and 79 per cent. nitrogen: there is no carbon monoxide and this is attributed to the thin fuel bed and the method of introducing the secondary air at a point where the carbon monoxide can be effectively burnt. Since there is no combustible gas present in the magazines there is no danger of explosion. With regard to the air-tightness of the magazine doors, this has been improved considerably since the first boilers were introduced. The newer doors are of the swing type which, since they can be lifted off their seating, are subject to less wear on the door frames and therefore remain reasonably air-tight for a considerable period.

Dr. Davidson has asked whether the carbonization of nut coal would give a dense coke of high combustibility. It has been our experience that, using nut coal, carbonization can be carried out more quickly and thus it is possible to improve the combustibility of the resulting coke. The bulk density will depend upon the caking power of the coal. In Technical Paper No. 26 of the Fuel Research Board, "The Influence of Size of Coal During Gas Manufacture," it is stated that with weakly-caking coals the density of the coke is increased by increasing the size of the coal particle, whereas with strongly-caking coals the reverse is true. The most satisfactory method of increasing bulk density and combustibility is to carbonize blended coals, but the economics of the process have still to be investigated.

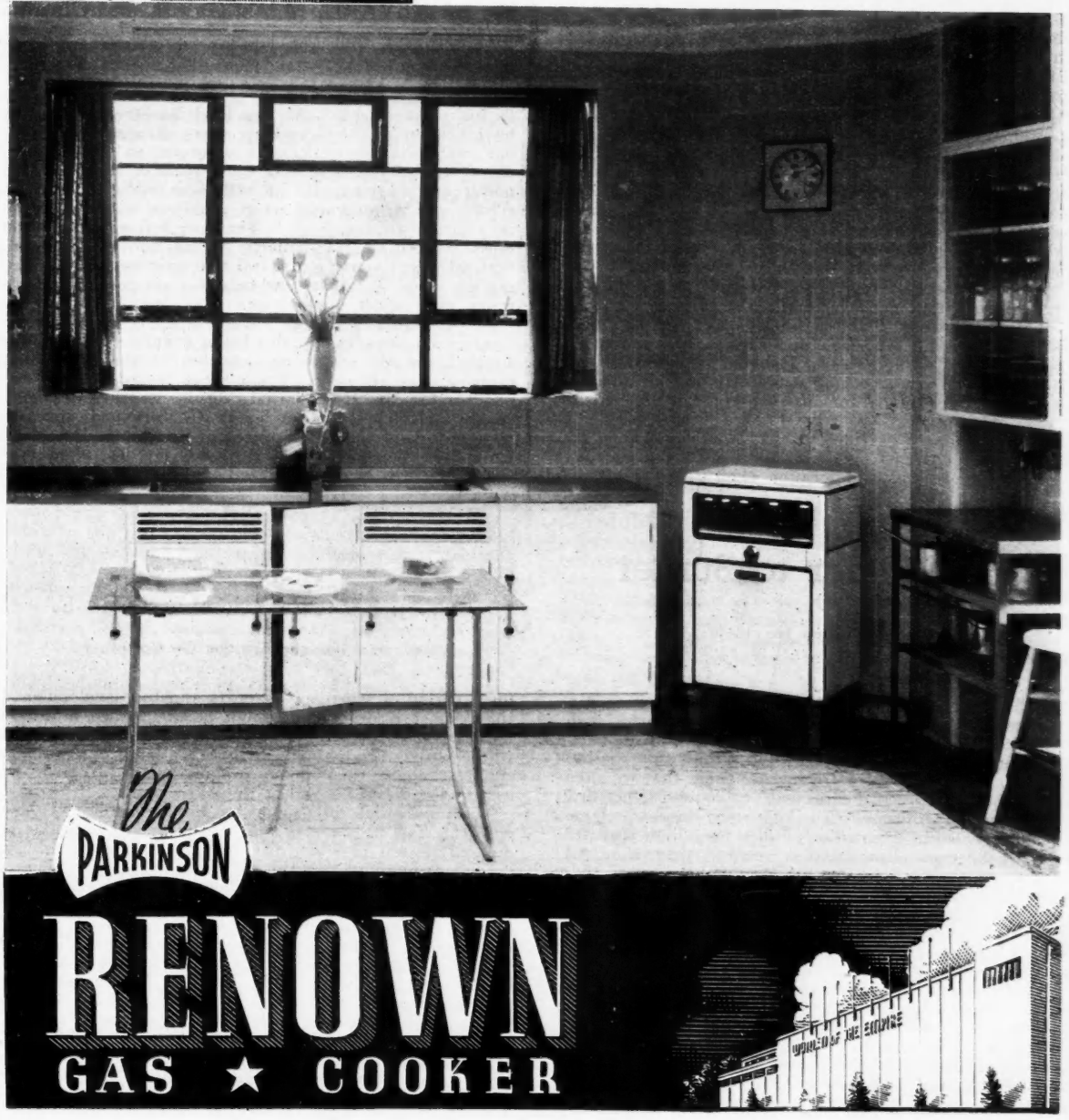
Dr. Davidson has questioned the desirability of complicating a coke grate by providing shaking firebars. I feel that a well-designed shaking grate is of advantage since it provides a simple method of removing the ash without the disadvantage of breaking the pieces of coke which so often results from the too heavy application of the poker. The packing of the coke which results from vigorous poking retards the ignition of the fresh charge of coke at a time when rapid ignition is necessary.

Mr. Hodsman has emphasized the importance of ash volume in determining the suitability of open fire coke. This is not only of importance in open coke fires but also in gravity-feed boilers where a flocculent ash will cause a smothering of the coke in the centre of the grate and this makes it necessary to de-ash the fuel bed more frequently when such a coke is used. I agree with Mr. Hodsman that a satisfactory test for ash volume would be of great assistance in the control of coke quality.

I am indebted to Mr. Hutt and to Dr. Taylor for the additional information they have given on the semi-pro-

ENHANCING THE PRESTIGE OF GAS FOR COOKING

THE RENOWN IN THE MODERN KITCHEN ON THE WOMEN'S GAS COUNCIL STAND, EMPIRE EXHIBITION, GLASGOW.



ducer furnace and thermostatic controls. Dr. Taylor has mentioned the stalling motor, a control recently introduced to this country from America where it has been used for a number of years. Our method of testing controls has been to try them first on our laboratory boiler plant and subsequently on selected boiler plants on the district where they could be observed from time to time. In this way satisfactory service is ensured provided the control is not misused. It has been found that with certain controls local conditions play a big part in their successful operation and in spite of the large number of controls which are available there is still scope for a robust control such as that mentioned by Dr. Taylor.

In answer to Mr. Toogood I would like to make it quite clear that following representations by the London and Counties Coke Association all the leading boiler manufacturers have agreed that they will not manufacture a domestic boiler which has a smaller fuel capacity than 0·49 cu.ft. This is amply sufficient to enable the boiler to be run under banked conditions on coke for periods of 8 to 10 hours. Some years ago an auxiliary hopper which was attached to the charging door on the top plate of domestic boilers was placed on the market but very few have been sold.

Suitable control of the combustion rate in domestic hot water boilers can be obtained by operating a check-draught damper from a simple pressure-bellows type direct-acting thermostat. Such a system has been tested at Fulham and in several private installations and has proved satisfactory not only in reducing the deposition of sludge from hard water but also in improving the performance by reducing clinker formation. At present the total cost of installing it is between £2 and £2 10s. 0d. and this price has prevented its general adoption.

Works Control

Communication No. 185

by

W. HAWKYARD, M.Inst.Gas E., M.I.Chem.E.

(Works Engineer, Willoughby Lane Works, Tottenham and District Gas Company)

Dr. J. G. KING (Fuel Research Station) wrote: I have to compliment Mr. Hawkyard on a very interesting Paper explaining the special arrangements which obtain in his Works for the efficient control of gas manufacture. That part of the control which interests me most is the careful watch which is kept upon the quality of the coal. I am sure that Mr. Hawkyard has a great deal of valuable information as to the behaviour of different types of coal in both continuous vertical retorts and intermittent chambers. Had he elaborated his Paper to include some of this information, I am sure it would have been of the greatest value to other gas engineers. He does not say, for instance, whether he uses different coals or blends for the two types of retorts which he operates. I should be interested to know whether he does, because it is fairly well established that the best type of coal for one system is not necessarily the best for another.

I am particularly gratified to find that he makes an extensive use of Gray-King assay to check the properties of delivered coals, and to determine when they are not up to his requirements. At the Fuel Research Station we have been using the Gray-King assay in connexion with all our carbonization work. For example, in 1929 we compared the behaviour of a series of coals of varying caking power and varying size in both Glover-West continuous retorts and in horizontal retorts, and examined the results in relation to the assay. The correlation factors were most interesting, particularly in relation to continuous vertical retort work, and I feel that this method of assessing the value of coal for carbonization purposes would well repay even wider application.

In connexion with our survey work, coal seams and commercial samples are also being examined in this way, so that records are being collected of the gas making properties of all coals. From these records it would be possible for Mr. Hawkyard to decide whether any given coal would be suitable for use in his works. If the assay were more widely used in the same manner as Mr. Hawkyard does, the Gas Industry would be able to select its coals with greater certainty and also check deliveries.

From Holder to Burner

Communication No. 184

by

W. J. SANDEMAN, M.Inst.Gas E.

(General Manager, Croydon Gas Company)

The AUTHOR, in reply, wrote: I am indebted to Mr. Whitehead for opening the Discussion and note with pleasure that he is in agreement with most of my remarks.

In regard to the high pressure supply to the Carshalton gasholder, I omitted to state in the Appendix that we have a compressor capable of dealing with 80,000 cu.ft. per hr., at a pressure of 30 lb., which is kept as a stand-by plant. This compressor was originally installed for a high pressure supply to the Carshalton district, but was thrown out of use on the score of economy when the holder was erected. The boosting mains which deliver gas up to a pressure of 40 in. are used exclusively as boosting mains and feed the ordinary low pressure mains through district governors. Although Croydon gas is not dehydrated, I agree that where services are laid in pitch and wooden troughs there is no reason why mild steel should not be used, but as only a comparatively small number of services are laid in troughing, it is not worth while keeping stocks of both steel and wrought iron for service work.

Mr. Whitehead asked what would happen in a case where a Mains Re-enue Agreement has been entered into for a period of seven to ten years and the development of the district is dropped through failure to sell or let the houses. My answer is that I have never yet had a case where this has happened. If we think there is the slightest doubt we demand a contribution towards the cost of the main, instead of the Agreement.

The number of calls made by House Examiners varies with the class of property, but a fair average is twelve per day. It is not possible, owing to the need for arranging special campaigns and the following up of customers in roads where electric cables are being laid, to work in small territories consistently, although this is the ideal at which to aim. A commission scheme has been in force at Croydon for many years and has undoubtedly proved a great incentive, not only to the sales and service personnel, but to the staff and workpeople in other departments, since everybody in the Company's service is eligible for commission and is provided with customer prospect cards.

Water heaters supplied and fixed on hire have to be taken for a minimum period of three years. Purchase outright or by instalment purchase has much to recommend

it in place of simple hire, but the local competitive situation in our case demands a fairly generous rental policy.

In regard to Mr. Lacey's observations, I note that he supports my contention that sales effort alone and unaided by technical understanding of the selling problem is a potential danger, but that he suggests that the development of service, side by side with the sales effort, should be aided by Regional Domestic Centres. There is no doubt that the work of Watson House in this connexion is a " pointer " to the Gas Industry as a whole.

I do not want my views on the maintenance of a proper balance between " ironmongery " sales and gas sales to assume exaggerated importance, but in my opinion it is necessary to guard against gauging progress merely on what one might term the retail selling side of our business. In the case of my Company we have for many years actively pushed the sale of apparatus and by this means have weeded-out very large numbers of old-fashioned appliances. I fully appreciate Mr. Lacey's point in regard to the consolidation of one's competitive position by selling replacement apparatus, but we must not be content to stop there. The apparatus must be carefully and regularly serviced and customers thoroughly instructed in its proper use.

Tariffs.

In regard to tariffs, I related my figures of 5d. to 6d. per therm for large loads to a general flat rate of 9d. per therm, because the latter is fairly common, and I still feel that if a two-part tariff is to prove instrumental in greatly increasing the output of gas the critical qualifying consumption will be, comparatively speaking, such a low figure that revenue must inevitably be jeopardized. There is, however, justification for a two-part domestic tariff for relatively large loads. We are carefully considering the question of tariffs, but all I can say at the moment is that we are feeling our way. For large industrial and big central heating loads two-part tariffs have been exploited for some time past with encouraging success.

Mr. Gill's remarks on water heating are interesting and the position to my mind can be summarized as follows: Water heating has its own local and peculiar problems. Nobody can presume to lay down any hard and fast regulations as to which of the several types of apparatus is the best. Each type has its appointed place, and recommendations can only be made by technically-informed salesmen after a careful study of the customer's needs, his pocket, the type of house, the character of the existing system (if any) and so forth. Experience and local conditions count for much. Personally, I incline more favourably to thermal storage heating than to instantaneous heating, but often a multi-point machine offers the best way out of a practical difficulty. Water heating business is growing rapidly in Croydon and recently we have been particularly successful in the face of subsidized electrical competition (water heaters rent free!) in pursuing our policy of offering on hire a 2¼ gal. thermal storage sink water heater. I agree with Mr. Gill that everything should be done to encourage the water heating load; and because of this it seems to me that, quite apart from the question of the price of gas, one must review the facilities offered to the public to acquire the use of apparatus, as in many cases the terms upon which the apparatus is made available precludes its adoption. Instantaneous in general practice, it must be admitted, provide a poor load factor and, of course, the by-pass consumption does very little useful heating work. The question of unmetered by-pass consumption is an important one, and we have taken many tests on meters brought in from time to time, at very low rates of consumption, to verify their ability to register accurately tiny quantities after a period of use on the district. These tests have been reassuring. Where thermal storage heaters are concerned, the maintenance or by-pass consumption would not fall to such a low figure as to give rise to unregistered gas and, of course, this consumption is doing effective work all the time, *i.e.*, keeping water hot against demand.

For some long time past in Croydon we have aimed at encouraging people to go over from solid fuel to gas in the summer time for hot water supply and to have a small gas-heated circulating boiler fixed either in conjunction with, or independently of, the coke boiler.

Importance of District Maintenance.

I should like to thank Mr. Browne for his kind remarks. We have tried to make the foundations of our business out of satisfied customers, and I maintain that the better we are able to look after customers' apparatus the more likely we shall be to popularize the use of gas. District maintenance work is of paramount importance, and this is the work I chiefly have in mind when I talk of service to customer.

In answer to Mr. Browne's question in connexion with Home Advisory Service, up to the moment no local branch of the Women's Gas Council has been formed, but our Lady Demonstrators keep in very close touch with a large number of women's organizations, such as Townswomen's Guilds, Mothers' Unions, Area Welfare Centres, Red Cross Nursing Centres, etc.

In regard to Mr. Marsh's observations on the merits and demerits of thermal storage heaters and instantaneous heaters, I have dealt with this question in my reply to Mr. Gill, but I would reaffirm that, all factors taken into account, my preference, for several reasons, is for thermal storage water heating. Pressure-operated multi-point machines with automatic valves are a potential danger and it is no use glossing over Mr. Marsh's practical point that explosions can occur. This is true, of course, only if negligent handling of the apparatus is the cause, but still there is a danger even though safety pilot cut-off devices are employed.

Mr. Marsh, in dealing with the registration of meters, apparently advocates a systematic inspection of all meters, coupled with a low consumption test *in situ*. This is a practice we have adopted for many years.

Mr. Masterman is right in assuming that in my opinion we are not in the position locally at the moment to offer a domestic two-part tariff with a low critical consumption. Such a tariff would be a hazard, as it would have to be optional and many people would undoubtedly exercise their option without taking greatly increased quantities of gas, which is absolutely essential if the tariff is to prove a financial success. Our optional two-part tariff to large domestic consumers is linked up with heating, hot-water supply and cooking, not primarily because of the specific use of gas for these purposes, but because the combination of these loads in the type of property we envisage reveals a probable consumption of 1,000 therms per year. Such a consumption is, I agree, a very high critical rate under which the majority of domestic consumers are debarred from participating. We are catering for really substantial loads, such as complete hot water supply, central heating, cooking, etc., in the large " well-to-do " homes.

Mr. Masterman's views in regard to storage water heaters versus instantaneous water heaters are largely the same as my own. The matter must be left to the discrimination of individuals who are competent to recommend the right apparatus in its appropriate place.

Concessions to Builders.

In regard to Mr. Dyde's remarks, he is under some misapprehension when he talks about concessions to builders. The minimum of six fuel points per new house is required by the Company if the builder wishes to obtain the standard free allowance of 25 ft. of service pipe on private property. Substantial concessions are not made in regard to new mains. On the contrary, a substantial contribution is collected from the builder towards the cost of the mains, and all carcassing is paid for at the rate of 10s. per point, together with additional service lengths over 25 ft. on private property. Even assuming that the builder buys and installs apparatus we do not make big concessions on our standard terms for laying mains, services and carcassing. We do, however, give the builder a substantial trade discount if he will buy and install apparatus. The threatened all-electric house, unless a lot of work is done free, is very largely a matter of bluff and should not be taken too seriously.

The figures Mr. Dyde gives in regard to capital expended per mill. cu.ft. on distribution and other data are interest-

ing, but, if I may say so, sound though the reasoning may be, the method of working out what one can afford to give away to a builder appears to me to be rather involved; and I am inclined to wonder if the Gas Undertaking would suffer were there no such builders' " load value " subsidies on installation costs.

Mr. D'Eyncourt's remarks on tests at " by-pass " rates on meters brought in from the Tottenham district support my view. I do not feel there is much to worry about on the score of increases in the " unaccounted-for " figure mounting up as the result of the non-registration of meters at small rates of consumption; but it is a possibility, particularly with old meters, which should not be overlooked.

Contact with a large number of the " small class " of customers has definitely established the fact that the woman of the house puts by weekly a certain amount of " gas money " and that if she has to spend much of this allotment on the purchase of apparatus she has correspondingly to economize in her purchases of gas. There is not the margin, very often, to treat the purchase of apparatus as an extra item for equipping the home—I wish my experience prompted me to believe that this was not the case.

A certain amount of rental business must be anticipated where electrical competition is severe; but apart from this it would be interesting to know from Mr. D'Eyncourt if, generally speaking, his Company is able to collect regularly all instalments due from coin consumers. We have tried this and have found great difficulty in a number of cases in collecting the instalments, but I realize that the whole question is a many-sided one and one of variable solutions, since the answer is so closely related to local conditions.

Malta and Mediterranean Gas Company, Ltd.

The Annual General Meeting of the Malta and Mediterranean Gas Company, Ltd., was held on Tuesday, June 14, 1938, at the London Offices of the Company, 5, Great Winchester Street, E.C. 2—Mr. A. M. PADDON, M.Inst.C.E. (Chairman of Directors), presiding.

The SECRETARY (Mr. G. Murray Burton) read the notice convening the meeting, together with the report of the Auditors, and the list of stockholders was duly sealed and signed. The Directors' Report and Statement of Accounts for the year ended March 31, 1938, were taken as read.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN, in moving the adoption of the Report and Accounts, said that if the statement which it was the Board's duty to present that day were indicative of the future position of the Company, or even the present position, it would be grossly misleading, because it related to their emergence from a period of great difficulty, of heavy disbursements, and non-recurring expenditure, also associated with a thorough re-disposition of their finances and capital. Such conditions did not contribute to a very satisfactory Report from the trading viewpoint during the period under review.

To epitomize the facts, their expenditure during the year, on Revenue Account, amounted to £2,245 more than in the year before, while, on the credit side, they had received from sale of gas, which was far more significant than a mere figure, £1,462 more, which left an unfavourable comparison with the previous year of £784. The previous year, however, was not too good—showing as it did a decrease of some £500—so altogether they wanted something like twelve or thirteen hundred pounds to meet their requirements for dividends as recommended.

This unfavourable comparison must be carried forward to the Profit and Loss Account, where another figure immediately presented itself in that they brought into the account £23,064 and took out £17,423, which showed that their carry-forward had been reduced by £5,641. That amount was incidental to the re-adjustment of which he had spoken, and was accounted for by a charge in respect of National Defence Contribution and by the writing off of £3,000 of capital which was issued in excess of the amount received. They had to adjust their accounts in that way before they could bring any question of reduction in capital before the courts. Then, of the obsolete plant at their disused gas-works written off, £871 had been charged there. If all these items were taken into consideration they would account for the amount by which the carry-forward had been depleted.

Now, continued the Chairman, they would go to the end of the matter and see whether all the disturbing factors had been finally dealt with. The governing figure on the left-hand side of the balance-sheet was the reduction of their capital indebtedness to £73,845. If they would look on the other side they would find that £71,213 had been invested in trustee securities, which had a market value at March 31, 1938, of nearly £90,000. So they had preserved some amortization of capital in proportion to what they had before they started. By the reduction in capital they would save £2,000 per annum. At the same time it must be remembered that the nominal capital had been returned with an average of 50% premium, and which invested in gas undertakings in this country would give something like the rates paid on the capital returned. Now they had every prospect of maintaining a full 10% on the reduced capital.

As he had said just previously, they must not judge the Company by its present position. The increase in the sales of gas which he had mentioned had occurred almost entirely during the last four months of the year, which was some indication of what was going on at the present time. He would not be so optimistic as to tell them what the development had been, but it had been very large indeed. For some years past they had been unable to record any increase in gas sales; to-day an increase was promised at an almost unparalleled rate, due to the activities in regard to the Defence Services. Whereas they suffered in the past from lack of activities in that respect, now they were benefiting. When they considered this in conjunction with the fact that the amount available for dividend still allowed a distribution of 10%, they would agree that there was a brighter prospect than he had been able to present for many years past.

In conclusion, the Chairman pointed out that the accounts were presented in a new form and had been prepared with great skill by their Secretary and financial advisers. This had to be done as a result of the re-disposition of their finances. He ended, therefore, on a higher note of hope than he had been able to indulge in during the past ten years. In addition to other favourable features they had bought their coal ahead to an extent that would almost see them through the current year, though freight charges were extremely difficult, varying as they did from 7s. to 14s. 6d. The coal owners in this country chastised them with whips, but when they came to freights they chastised them with scorpions.

The CHAIRMAN then formally moved the resolution for the adoption of the Report and Accounts, which was seconded by Mr. A. W. OKE, B.A., LL.M., and carried unanimously.

In answer to questions, the CHAIRMAN said that the Company's new showrooms were in course of construction and should be completed within the next three months. The increased sales of gas were directly or indirectly due to the increased activities of the Services, while the relaxation of tension in the Mediterranean consequent upon the wise action of the Prime Minister had contributed very materially to a more favourable atmosphere generally.

Dividends.

The CHAIRMAN thereafter moved:

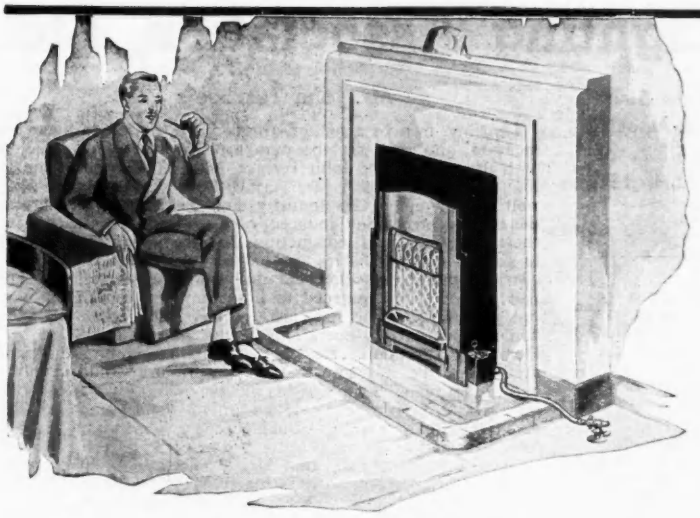
> That a final dividend at the full rates on the first and second preference stock and a dividend of 5% (free of income-tax) on the ordinary stock, be declared, making for the year (with the interim dividends paid in December last) a total dstribution of 7% on the first preference stock, 7½% on the second preference stock, and 10% (free of income-tax) on the ordinary stock, such dividends to be paid on the amount of capital issued prior to the reduction.

The resolution was seconded by Brig.-General G. V. CLARKE, C.M.G., D.S.O., and carried unanimously.

Re-Election of Director and Auditors.

The retiring Director (Mr. Frank H. Jones, M.Inst.C.E.) was re-elected, and the Auditors (Mr. William Cash, F.C.A., and Mr. Hyde Clarke Burton, F.C.A.) were re-appointed at a remuneration of 40 guineas each.

The proceedings then terminated with votes of thanks to the staffs in London and Malta and to the Chairman and Directors for their conduct of the affairs of the Company.



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IT OPERATES BY MEANS OF ITS TIME-CLOCK AND A SIXPENNY-PIECE. The time set for the Sixpence can be varied between A QUARTER OF AN HOUR and FOUR HOURS, and any unused period may be CANCELLED.

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South African Lighting Association, Ltd.

The Forty-Ninth Ordinary General Meeting of the South African Lighting Association, Ltd., was held at the Association's London Offices, 48, Copthall Avenue, E.C. 2, on Wednesday, June 15, 1938—Mr. WILLIAM CASH, J.P., F.C.A., Chairman of Directors, presiding.

The SECRETARY (Mr. William Cash, Jnr., M.A., F.C.A.) read the notice convening the meeting, together with the minutes of the previous ordinary general meeting, held on June 2, 1937, which were confirmed and signed. He then read the report of the Auditors on the Accounts and Balance-Sheet.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN said he presumed the shareholders present would take the report and accounts as read, and he would therefore proceed to move that they be approved and adopted. They had in their hands both the Revenue Account, which the Directors now published, and the Balance-Sheet, and it was satisfactory to note that, when the revenue was compared with that of the previous year, it showed an increase of £334. The figure of interest on investments, &c., was down £84, due to the fact that they had sold their War Loan at a profit of £174 which came into the results for the previous year. Dominion Income-Tax was on this occasion £404, which was less by £165 than twelve months ago. Bank interest, on the other hand, was more by £87. The Board proposed to declare again a dividend of 4%, which would enable them to carry forward the sum of £6,897, or £88 less than the sum brought in. But a year ago, even with the help of that £174 from the Reserve Fund investment profit, the carry forward was decreased by £243, so that in this respect they were doing somewhat better on the present occasion. He thought that, with so large a carry forward after paying the dividend proposed, they need have no concern at having drawn upon the amount to the small extent he had indicated.

Increased Gas Sales.

Sales of gas at Port Elizabeth were up 1·85%. The leakage on this occasion was rather higher than in the previous year, but he thought there might be some reason for this, and they were hopeful of recovering their position in this respect during the current year. At Grahamstown the sales of gas were up by more than 12½%, which was extremely satisfactory. The leakage there had come down to nearly its normal figure of just under 10%. The previous year it was very high, in consequence of extensive drainage operations all over the town, which naturally had interfered with their mains. In the year under review they had done better with coke by nearly £600, but tar had not been quite so satisfactory. Coal costs were up by about £1,100, but, of course, they had used more. The increase in the cost of coal was about 2d. per 1,000 cu.ft. Unfortunately, too, the quality was not entirely satisfactory. During the past year a new gasholder had been erected, and it was brought into use at the beginning of 1938. This was a spiral-guided holder, of a capacity of 150,000 cu.ft. The cost was £3,350, and was included in the capital expenditure during the year shown in the Balance-Sheet. In fact, it formed the major portion of last year's expenditure; the remainder having been in connexion with extensions of mains. This new holder was built in the tank of the one which it replaced, and which was of about 50 000 or 60,000 cu.ft. capacity.

In the accounts there was a cross transaction in respect of the Renewal Fund. They had had a sort of internal reserve for depreciation and renewals, apart from retort renewals. In the Balance-Sheet they had transferred this sum of £6,257 to the Renewal Fund, and then they had made, as usual, the necessary allocation to cover retort renewals, and had written off certain expenditure. As the result of these operations, the Renewal Fund now stands at £4,937, as against £2,679 a year ago. It gave a more accurate picture of their reserves. In the Balance-Sheet, Income-Tax Reserve was really a free reserve. It was a surplus which they could use for revenue purposes if it was necessary.

The cash position of the Company, in view of the capital expenditure to which he had referred, was not very satisfactory. Their Bank overdraft had grown to £6,930, which was a rather substantial liability. The cash at Bank, too, was less than a year ago. They had their investments which were the same as a year ago, because the War Loan was sold before the end of 1936; and these investments were worth more by over £2,000 than they stood at in the Balance-Sheet, which was satisfactory.

Mr. John Terrace's Visit.

He came now to a matter of which he desired to make special mention, and this was the paragraph in the report which dealt with the visit of Mr. John Terrace, M.Inst.C.E., one of the Directors, to South Africa. Mr. Terrace bore a name which was very well known in the Gas Industry, and the Directors congratulated themselves on having induced him to join the Board. It was therefore with great satisfaction that they heard he was willing to go out to South Africa and inspect the Association's works and districts both at Port Elizabeth and at Grahamstown. Mr. Terrace had done so, and returned to this country a month or two ago, but unfortunately he had just recently been taken ill, and had had to undergo two operations. Thus he was unable to be with them that afternoon. He (the Chairman) was very disappointed at this, and he was sure that the proprietors would deeply sympathize with Mr. Terrace in his misfortune. Obviously some time must elapse before he would be among them again; but he had given the Board a most valuable report, which they were carefully considering.

There were some facts that Mr. Terrace had pointed out which he might briefly refer to as being of special interest. Of course, Mr. Terrace had dealt with each of the Stations, and with regard to Port Elizabeth he said that the total sales over the last four years had gone up by nearly 15%, which was not too bad. This had been brought about mainly by industrial consumers. That was to say, it was among the large consumers that the increase had taken place. The consumption by the large consumers had gone up by over 60%. There had been some decrease in the case of slot consumers, while the ordinary consumers had about held their own. In Grahamstown, the improvement was even more marked. There the sales in four years had gone up by 65%, which, again, was largely due to the development of gas consumption for industrial purposes. Grahamstown was a place possessing a large number of schools and colleges, and it had a relatively big white population. But, of course, dealing with a Company of this size, talking in percentages might be a little misleading, because the total output was not a large one measured by English standards. While with regard to ordinary consumers, their Engineer and Manager, Mr. J. H. Goldsmith, said he had sold a number of appliances, and was engaged in active propaganda, the total increase in the case of ordinary consumers was relatively small.

One naturally looked, in these circumstances, at the question of the price of gas. It would be easy for the Company to reduce the price, but by so doing they might be jeopardizing the position from the point of view of their dividends. From experience elsewhere in South Africa it was evident that such cuts carried some danger unless they brought about a substantial increase in consumption.

Mr. Terrace had gone into the question of main extensions but these were expensive, and it was difficult to get an accurate idea as to what results would come from extensions of an experimental character. There were many developments in Port Elizabeth, but the percentage of gas consumers to population throughout South Africa was relatively small, and it would be a little risky to embark on these extensions until they were satisfied that each one would pay for itself. To secure large consumers at Grahamstown they had had to make substantial reductions, but these were individual cases, where one could tell what the consumption was going to be, and they had brought with them a relatively big increase in the actual consumption. On the other hand, the Directors were not forgetful of the fact that the overheads were relatively high, and that if they were spread over a larger production a lower price might be justified. However, Mr. Goldsmith was due over here on furlough later on in the year, and so they were leaving over the question of a possible reduction in price for discussion with him and Mr. Terrace.

Team Work and Co-operation.

Before leaving the question of Mr. Terrace's visit to South Africa, he would like to read from a letter which he had received from him a few days ago. In this letter, Mr. Terrace said:

> "As it seems unlikely that I shall be able to be present at the shareholders' meeting, I am sending you this note, in case you may wish to mention in your speech how favourably impressed I was with the spirit of team work shown by the various members of the staff in both towns. The staff is, of course, not very large, but each one is made to understand that he or she plays an important part in advancing the interests of the Association, which cannot fail to impress the public favourably. A very friendly feeling was in evidence

It is related that there was, in ancient times, a young man who had married the daughter of a renowned worker in metals and who aspired to surpass his father-in-law in his Craft. So he journeyed to distant lands, and at length he found the true Philosopher's Stone with which he produced much gold and made objects therefrom.

But, alas! he could sell them for little more than the value of the gold, whereas the older man, though he had to buy his gold, made objects of a perfection almost beyond price.

Sorely troubled by this, the young wife visited her father secretly to ask the wherefore.

"Ah, my daughter," her father exclaimed, "tell your husband that he has forgotten the one thing more precious than gold."

"And what is that?" asked the girl.

"It is Craftsmanship, my daughter, which cannot be lost, stolen or transmuted, and whose value cannot be weighed in the mightiest scale in the world."

As modern as to-morrow, but with the knowledge and experience of 144 years, Newton Chambers & Co., Ltd., specialise in the manufacture of Blast Furnace Plant, Gas Works Plant, Steel Works Plant, General Chemical Plant, Benzole Plant, By-Product Plant, Cast Iron Tanks, Steel Tanks, Coke Oven Machinery, Pig Iron, Excavators, Economisers, Air Heaters, Recuperators, General Castings for the various trades and all forms of Light Castings.

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during the cookery demonstrations which were given during my visit.

"I was also pleased to note the co-operation with the Road Authorities, &c., and the kindness and consideration shown to us in many little things by the officers of the Corporations."

This letter, continued the Chairman, was distinctly gratifying to the Directors, because it was written after Mr. Terrace's visit to the spot, and dealt with the two great questions of team work and spirit of the staff, and the relations of the Association with the Local Authorities.

In the course of his report, Mr. Terrace told them some very interesting things. With regard to the position of gas generally in South Africa, he pointed out that the white community moved about from town to town, and went into houses in new areas where electricity was available; and there was the difficulty that the cooking was done by natives who were accustomed to solid fuel. Thus many of the people who lived in these towns had never come in contact with gas, so that they could not be expected to be altogether "gas-minded." It had to be remembered that there were only four gas-works in South Africa, of which two belonged to their Association. It was up-hill work selling dear gas against electricity at a low price, and this was the sort of problem the Directors had to face. With regard to Port Elizabeth, it had, Mr. Terrace said, a population of 48,000 Europeans, it enjoyed a fine climate, and it had been provided with a breakwater and docks where the largest liners could be accommodated. Thus it was likely to develop into the most important port in the Eastern Province of the Union. Of recent years the industrial development had been taking a foremost place, and manufacturers had come there to some extent because they knew that they could get gas. The Directors were not disturbed therefore as to their position as a whole.

But there was this matter of extensions, which might mean the provision of additional capital. The Directors had not yet made up their minds as to what they would do in this connexion. At the moment they were practically up to their existing limit as fixed by the Articles. Therefore, at an extraordinary meeting to follow that one, the Board were going to ask the shareholders to give them additional powers. He did not think there was anything more about which he need detain them.

Mr. HENRY WOODALL, J.P., M.Inst.C.E., formally seconded the adoption of the report and accounts.

Mr. A. W. OKE remarked that the Chairman had favoured them with a most lucid Address. Personally, he could not help thinking it would be unwise to reduce the price of gas to ordinary users. The Board were dealing with the large consumers, and this, he thought, should meet the case. He hoped the shareholders would realize that the Company was so well managed as to give them full confidence in supporting any new issue of capital.

The resolution was then put to the meeting and carried unanimously.

Thereafter, on the proposition of the CHAIRMAN, seconded by Mr. T. N. G. JENNINGS, a dividend was declared of 4%, subject to income-tax of 4s. 6½d. in the pound.

The CHAIRMAN proposed the re-election of Mr. John Terrace as a Director, remarking that he was sure they would all join with him in saying how much indebted they were to him for his visit to South Africa. Happily, he was progressing satisfactorily, and the doctor was quite pleased with his condition. No doubt they would like the Secretary to send a message of sympathy with Mr. Terrace in his illness, and the wish that he might soon be completely restored to health.

Mr. WOODALL, seconding, said Mr. Terrace had given most generous service to the Company. They hoped soon to have him among them again.

The motion having been unanimously agreed to, the CHAIRMAN went on to explain that they had had the misfortune to lose, as the result of an accident, Mr. Percival D. Griffiths, F.C.A., who had been their Auditor for 35 years. The Directors appointed his firm, Messrs. Deloitte, Plender Griffiths, & Co., to fill the vacancy thus caused, and therefore the accounts were signed by them. He suggested that they be re-elected by the shareholders at the same fee of 40 guineas.

Mr. R. M. LONG moved to this effect, and it was agreed to.

On the proposition of the CHAIRMAN, seconded by Mr. F. R. SMITH, the staff and workpeople in London, Port Elizabeth, and Grahamstown were accorded a hearty vote of thanks, which was acknowledged by the SECRETARY. The Chairman and Directors were also thanked for their services, on the motion of Mr. OKE.

Borrowing Powers.

At a subsequent Extraordinary General Meeting, the CHAIRMAN moved, and Mr. JENNINGS seconded, the following resolution:

"That Article 96 of the Company's Articles of Association be amended to read:

'The total nominal amount of debentures, debenture stock, bonds, or other obligations of the Company issued (not including therein trade bills), together with the total amount of money otherwise borrowed or raised by the Directors for the purposes of the Company, shall not at any time exceed £45,000 without the sanction of the Company in General Meeting assembled, and the powers of the Directors to borrow shall be restricted accordingly.'"

The CHAIRMAN explained that the issued capital was now £90,000, and at present their borrowing powers were limited to one-third. These powers had been exercised by the issue of terminable mortgage debentures. It had been necessary to borrow from the Bank, and the question had been raised as to whether such borrowing was beyond their powers. The resolution was carefully worded so that the whole amount borrowed would not exceed 50% (which was very frequently given to Parliamentary gas undertakings to-day) without the sanction of a General Meeting. The Board had no definite move in mind, but they would not like to have to bring the shareholders together if they thought at any time that they should make another issue of debentures, or consolidate the existing issue, or go for preference shares. It was desirable that they should have these further powers, and he thought that what the Directors were asking was not unreasonable.

After some discussion the resolution was agreed to, with one dissentient.

Trade Notes

Modern Lamp Columns.

An extremely handsome brochure has been produced by Concrete Utilities, Ltd., Great Amwell, Ware, Hertfordshire, giving many artistic photographs of their reinforced concrete lamp standards in all parts of the country and a variety of situations.

Keith Blackman Publications.

Among recent publications by Messrs. Keith Blackman, Ltd., 27, Farringdon Avenue, E.C. 4, are three booklets dealing with drying plants, the importance of ventilation, laundry equipment, and paddle wheel fans.

Head, Wrightson, & Co., Ltd.

Over 196,000 tons of Head, Wrightson cast-iron tunnel linings are buried under London's streets to-day. This interesting fact is the theme of an artistic folder showing various phases of the gigantic extensions, now being undertaken by the London Passenger Transport Board on the underground railway system, in which Head, Wrightson products play such an important part.

Lubrication.

A new publication by Tecalemit, Ltd., Great West Road, Brentford, Middlesex, deals with industrial lubrication. Illustrations are given showing typical applications of various Tecalemit products, while a number of absolutely new lines are included in the catalogue, the various mechanical lubrication units and industrial coolant filter being of special interest to progressive manufacturers.

Messrs. George Wilson Gas Meters, Ltd.

We are informed by Messrs. George Wilson Gas Meters, Ltd., that they have acquired the goodwill, patterns, tools, and dies of the business of Messrs. Hutchinson Bros., Ltd., Barnsley and Doncaster, now in voluntary liquidation. Messrs. Hutchinson Bros., Ltd., have been established over 50 years and a large number of Gas Undertakings have their productions in use on the district. In assuring the continuity of the business, Messrs. George Wilson sincerely hope to be of service to the Gas Industry if only by safeguarding their interest with respect to the supply of spare parts from time to time.

We understand that Messrs. Hutchinson Bros. have always turned out a substantial and characteristically British built article, and it is Messrs. George Wilson's intention to maintain, and where possible to improve, this standard by bringing into use their up-to-date plant and research department. Those who have seen that plant will agree that their intentions in this connexion can be accomplished and as in the past their aim will be service and quality.

The "Hopkinson" Distributor.

The "Hopkinson" distributor combines the features and advantages of the Hopkinson Moynan patent steam purifier and Hopkinsons' patent "Nolos" slide valve trap, to which we have already referred in these columns, in a compact form. All condensate and dirt are removed from the saturated steam by the purifier section, which then distributes heat to subsequent processes in the form of clean dry steam. The trap section will dis-

charge to hot well the condensate removed by the purifier section, and is capable of lifting such discharge through a height of 2 ft. for every 1 lb. per sq.in. pressure in the system. Purification and condensate discharge are simultaneous and continuous in the distributor, and can be duplicated after every absorption of heat into a process. Owing to the higher rate of heat transfer claimed when the "Hopkinson" distributor is employed, process work can be expedited and machinery operated at higher speeds, giving a corresponding increase in output. The makers of the distributor are Messrs. Hopkinsons, Ltd., Huddersfield, and 34, Norfolk Street, Strand, W.C. 2.

The T.A.C. Pocket Compendium.

From Turners Asbestos Cement Company (Branch of Turner & Newall, Ltd.) we have received what might be called, but for its small size, a monumental work upon asbestos-cement. This is the new and revised edition of the T.A.C. Pocket Compendium, a compact little publication which is a veritable mine of information upon asbestos-cement products. It contains, in brief, details and data of over one hundred items of interest to those who are engaged in the distribution of these products and in constructional work and should prove invaluable to builders' merchants, builders, architects, water engineers, plumbers, municipal authorities, ventilating engineers. In this handy book of reference, the size of which is approximately 4 in. by 6½ in., will be found all the essential information upon asbestos-cement products, so that the possessor has at his finger-tips everything connected with this versatile building material. Fixing instructions are in many cases given, and no one who is engaged in buying, selling, or using asbestos-cement materials can afford to be without a copy of the T.A.C. Pocket Compendium.

De-scaling Problems Solved.

With its patented interchangeable interior, which enables a spare interior to be fitted in ten minutes, without dismantling, the Ufix boiler, it is claimed, affords the ideal solution to de-scaling problems. Among the advantages of the "Ufix" is that all the waterways can be seen, and the deposit easily removed without special tools or damaging the metal. By unscrewing two connexions the interior is removed through the top of the boiler, and a spare unit fitted with ease. The cost of the maintenance is considerably reduced by this method of de-scaling and the life of the boiler nearly doubled.

The patented water circulation is, it is claimed, highly efficient, and the output of boiling water is increased with a smaller gas consumption. A further saving of gas is effected with a patented gas valve, attached, in which the gas cannot be turned full on unless boiling water is being drawn off; this is important and avoids unnecessary scaling of the appliance.

The boiler is entirely automatic in action. It is self-feeding. The joints are brazed and are made of heavy gauge copper. The "Ufix" delivers boiling water only, from 2 pints per minute upwards, eight minutes after lighting the gas from cold.

The inventor is Mr. Eli Jackson, who has had over 35 years' experience in the construction of boilers. The sole manufacturers are the Ufix Boiler Company, Ltd., Terminal House, 52, Grosvenor Gardens, S.W. 1, who have recently taken over the patents of the inventor, together with the goodwill built-up during the eleven years which the Ufix boiler has been on the market.

Gas Undertakings' Results

Carlisle.

The annual report of the Carlisle Corporation Gas Department shows a net surplus of £1,444, compared with £4,149 during the previous year.

Bideford.

The first annual meeting of the Bideford Gas and Coke Company, Ltd., since the merger with Associated Gas and Water Undertakings, Ltd., revealed another satisfactory year's trading. During the twelve months to March 31 last more gas was sold than in the preceding year. The Torrington public lighting contract has been secured for a period of seven years, and the installation, which was completed in the early part of last summer, is claimed to be giving entire satisfaction. The dividends for the year are 14½% on the original shares and 11½% on the additional shares. After this distribution there will remain a balance of £1,683 to be carried forward. The quantity of gas sold was 686,197 therms.

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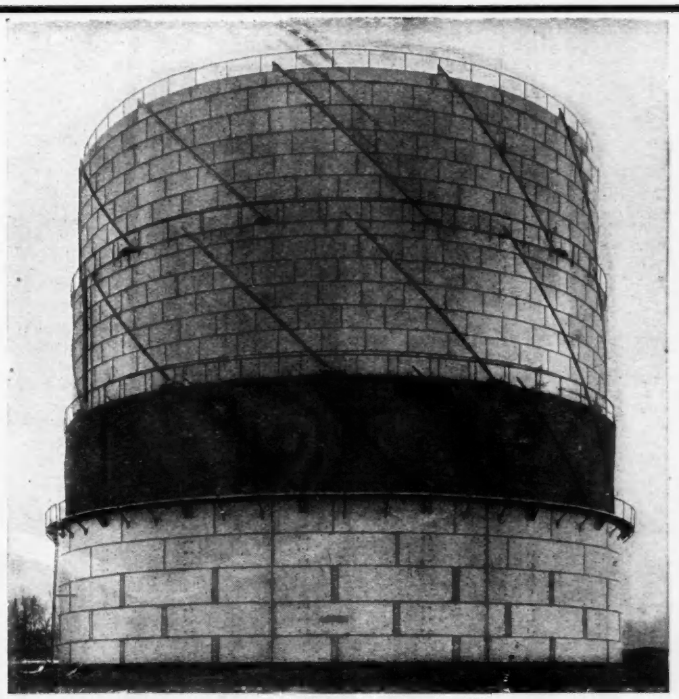

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Markets and Manufactures

Current Sales of Gas Products

The London Market

LONDON, *June* 20.

Prices of Tar Products in the London market remain steady at the following levels:

Pitch, nominal, at about 33s. per ton f.o.b.

Creosote, 5d. to 5¼d.

Refined tar, 3¾d.

Pure toluole, 2s. 1d. to 2s. 2d.

Pure benzole, about 1s. 9d.

95/160 solvent naphtha, 1s. 7d.

90/160 pyridine, 10s. to 11s.

All per gallon naked at makers' works.

The Provinces

June 20.

Crude Gas-Works Tar, 16s. 3d. to 21s. 3d.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 31s. 6d. to 32s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 31s. 6d. to 32s. 6d.* Toluole, naked, North, 1s. 7½d. to 1s. 9d. Coal tar, crude naphtha, in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5d. Heavy naphtha, North, 1s. 3d. to 1s. 3½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 5d.; low gravity, 4½d. to 4¾d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid, 60's, 2s. 3d. to 2s. 6d. Naphthalene, £13 10s. to £16. Salts, 80s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal; "B" quality unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Scotland

GLASGOW, *June* 18.

There is still no sign of a revival of interest, and prices remain easy in most departments.

Crude gas-works tar.—Actual value is 37s. to 38s. per ton *ex* works in bulk.

Pitch is quite without interest at about 26s. to 27s. per ton f.o.b. Glasgow for export and 25s. to 26s. per ton *ex* works in bulk for home trade.

Refined tar.—The home season is in full swing with price at 3¾d. to 4d. per gallon f.o.r. naked. Export value is unchanged at 3½d. to 3¾d. per gallon in buyers' packages at makers' works.

Creosote oil.—There is a good demand for local supplies at round the following prices: Specification oil, 5d. to 5¼d. per gallon; low gravity, 6¼d. to 6½d. per gallon; neutral oil, 5d. to 5¼d. per gallon; all *ex* works in bulk.

Cresylic acid.—Very few orders are being placed and prices remain weak as under: Pale, 97/99%, 1s. 10d. to 2s. per gallon; dark, 97/99%, 1s. 8d. to 1s. 10d. per gallon; and pale, 99/100%, 2s. 3d. to 2s. 6d. per gallon; all according to quality *ex* works in buyers' packages.

Crude naphtha is value at 5¼d. to 6d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—Business is scarce with 90/160 grade at 1s. 4d. to 1s. 4½d. per gallon and 90/190 heavy naphtha at 1s. 1d to 1s. 1½d. per gallon.

Motor benzole is called 1s. 4d. to 1s. 4½d per gallon.

Pyridine.—90/160 grade is 10s. 6d. to 11s per gallon, and 90/140 grade is 11s. to 12s per gallon.

Benzole Prices

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole..	0	9½	to	0	10	per gall. at works
Motor „ ..	1	3	„	1	3½	„ „ „
90% „ ..	1	4	„	1	4¾	„ „ „
Pure „ ..	1	8	„	1	8½	„ „ „

Contracts Advertised To-Day

Coal.

Chorley Corporation. [p. 994.]
Clitheroe Gas Department. [p. 994.]

Changes of Address

Murex Welding Processes, Ltd.

On and after June 20 the new address of Murex Welding Processes, Ltd., is Hertford Road, Waltham Cross, Herts. (Telephone: Waltham Cross 1050.)

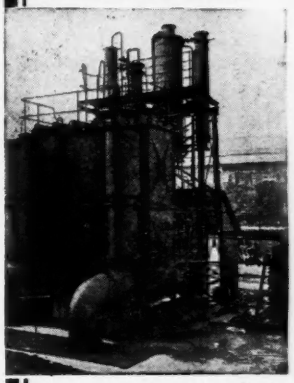
Lancashire Dynamo and Crypto, Ltd.

The Glasgow office of Lancashire Dynamo and Crypto, Ltd., is now at 80, Blythswood Street, Glasgow, C. 2. The telephone number is Central 3983-4 and the telegraphic address is "Dynamo Glasgow."

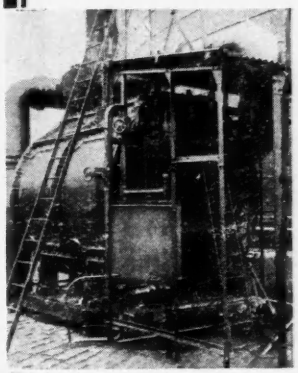
Simm, Lewis (Machinery), Ltd.

Owing to an increasing volume of business, Messrs. Simm, Lewis (Machinery), Ltd., find it necessary to move to larger premises at Mersey Engineering Works, Hollingworth, near Manchester. Telephone, Glossop 423.

These are "Permac" metal-to-metal Joints



"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.

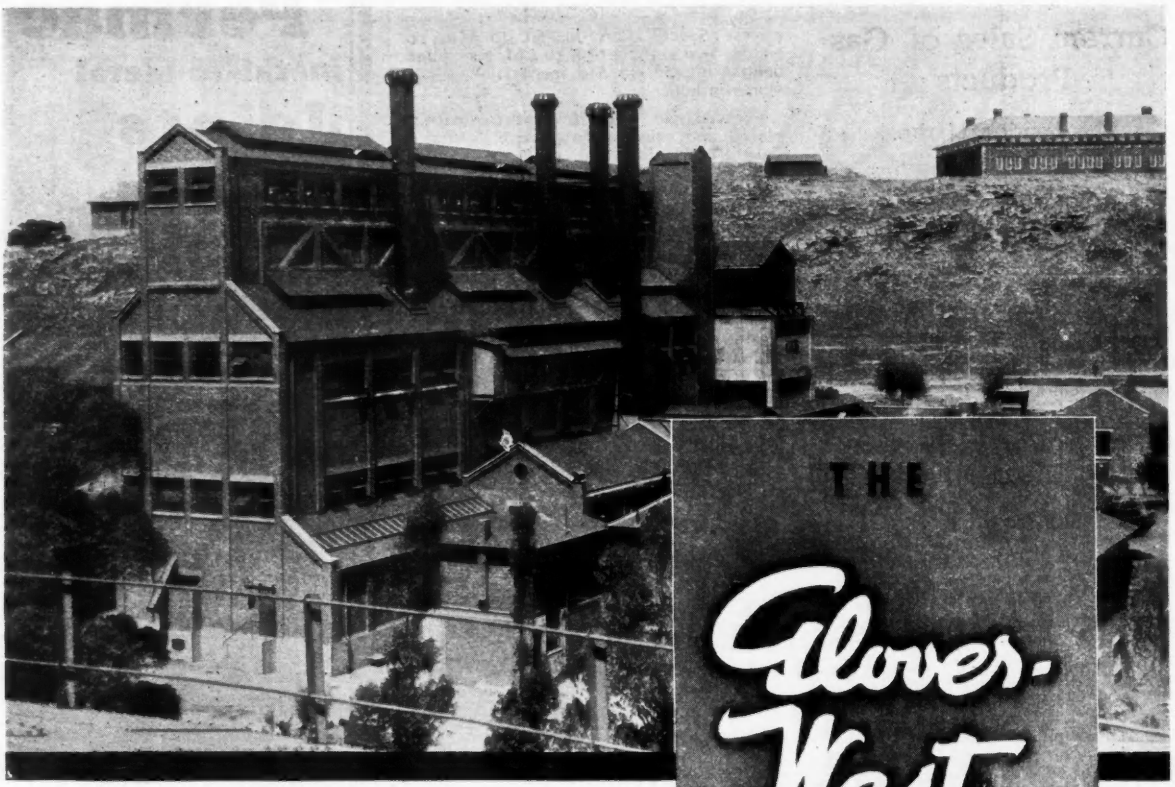
Wouldn't it pay you to use it?

Ever since 1913 "PERMAC," the original Metal-to-Metal Jointing, has been holding up difficult joints like these in important Gas Works and on Coke Oven Plants all over the world. Equally suitable for any joint—steam, water, gas, oil — screw pipe or flange. Send for particulars.

Permac
METAL-TO-METAL JOINTING MATERIAL

Sole Manufacturers:
THOMAS & BISHOP LTD
37, Tabernacle St.
LONDON, E.C. 2
Telephone: Clerkenwell 3351 (2 lines)

● CARBONIZATION IN VERTICAL RETORTS



The modern Glover-West vertical retort plant has behind it the accumulated experience of 64 years constant research and development for the advancement of gas production methods the world over.

● *423 plants have been built or are on order for 223 Gas Undertakings in 24 countries.*

The picture shows the three installations of Glover-West vertical retorts at Johannesburg City Council's Cottesloe gas works. The carbonising unit of the complete modern gasworks ordered for Johannesburg from this company in 1926 has been trebled to meet the rapid growth of demand. The latest extension put to work in 1937 is nearest the camera.

●

WEST'S GAS IMPROVEMENT CO. LTD.,

MANCHESTER: Albion Ironworks, Miles Platting ■ LONDON: Columbia House, Aldwych, W.C.2

GAS STOCKS AND SHARES

The fortnightly Account on the Stock Exchange came to a quiet finish on Friday last, and the volume of business throughout its run has been very small. The feature of the week was the unqualified success of the Government's National Defence Loan issue which went to nearly ¼% premium at the close. An immediate result of the issue was a marking down of existing Government stocks, but this had the effect of attracting buyers into the market so that on the week prices were only fractionally easier. The home-rail market showed a slightly steadier tendency. A welcome rally took place in the industrial section, iron and steel shares again being prominent. In the commodity groups, oil, copper, and tin shares were also firmer.

The Gas market continued quiet and featureless and the number of price movements was even less than a week ago. In the Official List, Alliance and Dublin lost 3 out of the 5 points gained the previous week, and Imperial Continental eased a further point to 118½. British 5½% preference and Gas Light 4% preference both hardened. In the Provinces, the only change occurred in Bristol 5% debenture which recovered the recent *ex div.* drop, while nominal quotations in the Supplementary List remained unchanged.

In the lists of gas stocks and shares on offer at the present time there appear some good bargains among "ordinaries." Commercial at 84 yielding £5 19s., Oriental at 153 yielding £7 4s. 2d., South Metropolitan at 107 to give £5 2s. 9d., and South Western £1 shares at 18s. yielding £5 11s. are a few examples. Imperial Continental is now obtainable at about 118, at which price the return works out at 8½%, and since the Company now has extensive interests in this country it is a little difficult to find any explanation for the present low market value of its stock.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 17.	Rise or Fall on Week.
1,767,439	Mar. 7	8	8	Alliance & Dublin Ord. ...	142—152	−3
374,000	Dec. 13	4	4	Do. 4 p.c. Deb. ...	95—100	...
558,190	May 9	5	5	Assocd. Gas & Water U'd'ts Ord.	17/6—19/6	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	19/—21/—	...
216,041	,,	§-/4	4	Do. 4 p.c. Red. Cum. Pref.	19/—20/—	...
278,590	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	17/—19/—	...
500,000	Mar. 7	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—99	...
558,890	Feb. 21	7	7	Barnet Ord. 7 p.c.	158—163	...
300,000	Apl. 4	1/4½	1/9½	Bombay, Ltd.	24/6—26/6	...
179,915	Feb. 21	9½	9½	Bournemouth sliding scale ...	195—205	...
590,407	,,	7	7	Do. 7 p.c. max. ...	157—162	...
493,960	,,	6	6	Do. 6 p.c. Pref. ...	132—137	...
50,000	Dec. 13	3	3	Do. 3 p.c. Deb. ...	78—83	...
262,025	,,	4	4	Do. 4 p.c. Deb. ...	98—103	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...
357,900	Feb. 21	7½	7½	Brighton, &c., 6 p.c. Con. ...	145—150	...
649,955	,,	6½	6½	Do. 5 p.c. Con. ...	128—133	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref.	125—130	...
885,000	Mar. 7	7	8	British Ord.	138—143	...
100,000	June 3	7	7	Do. 7 p.c. Pref.	140—145*	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115*	+2
120,000	,,	4	4	Do. 4 p.c. Red. Deb. ...	94—99*	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	102—107*	...
450,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—99*	...
100,000	22 May'33	6	4	Cape Town, Ltd.	1½—2½	...
100,000	6 Nov.'33	4½	4½	Do. 4½ p.c. Pref. ...	1½—3½	...
150,000	Dec. 13	4½	4½	Do. 4½ p.c. Deb. ...	65—75	...
626,860	Feb. 7	6	6	Cardiff Con. Ord.	120—125	...
237,860	June 3	5	5	Do. 5 p.c. Red. Deb.	105—110*	...
98,936	Mar. 21	2/-	2/-	Colombo Ord....	1½—1¾	...
24,510	,,	1/4½	1/4½	Do. 7 p.c. Pref.	23/—25/—	...
739,453	Mar. 21	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	16/6—18/6	...
296,144	,,	1/3·30	1/3·30	Do. 8 p.c. Pref.	23/—25/—	...
1,775,005	Feb. 7	5	5	Commercial Ord.	80—85	...
620,000	June 3	3	3	Do. 3 p.c. Deb. ...	72—77*	...
286,344	Feb. 7	5	5	Do. 5 p.c. Deb. ...	114—119	...
807,560	Feb. 21	7	7	Croydon sliding scale... ...	137—142	...
644,590	,,	5	5	Do max. div.	107—112	...
620,385	Dec. 13	5	5	Do. 5 p.c. Deb.	115—120	...
239,000	Feb. 7	5	5	East Hull Ord. 5 p.c.... ...	96—101	...
185,355	Feb. 21	6	6	East Surrey Ord. 5 p.c. ...	118—123	...
176,211	June 3	5	5	Do. 5 p.c. Deb. ...	115—120*	...
250,000	Nov. 15	7	4	Gas Consolidation Ord. ...	19/—21/—	...
250,000	May 9	4	4	Do. 4 p.c. Red. Cum. Pref.	17/6—19/6	...
19,223,324	Feb. 7	5⅝	5⅝	Gas Light & Coke Ord. ...	22/3—23/3a	...
2,600,000	,,	3½	3½	Do. 3½ p.c. max. ...	77—80	...
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref.	100—103	+1
2,993,000	Jan. 17	...	3½	Do. 3½ p.c. Red. Pref.	100—103	...
8,602,497	May 23	3	3	Do. 3 p.c. Con. Deb.	78—81	...
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb.	110—113	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb.	109—112	...
700,000	Mar. 7	3½	3½	Do. 3½ p.c. Red. Deb.	97—100	...
270,466	Feb. 21	6	6	Harrogate New Cons. ...	118—123	...
157,500	Mar. 21	1/2½	1/‡	Hong Kong and China Ord	‡—1	...
213,200	Feb. 7	6	6	Hornsey Con. 3½ p.c. ...	100—110	...
5,600,000	May 9	8	12	Imperial Continental Cap. ...	116—121	−1
223,130	Jan. 17	3½	3½	Do. 3½ p.c. Red. Deb. ...	88—93	...
285,242	Feb. 21	8½	8½	Lea Bridge 5 p.c. Ord. ...	167—172	...
11,751	Feb. 21	8	10	Maidstone 5 p.c. Cap.... ...	175—185	...
63,480	Dec. 13	3	3	Do. 3 p.c. Deb. ...	70—75	...
75,000	May 23	†10	†10	Malta & Mediterranean ...	137—142	...
				Metropolitan (of Melbourne)		
392,000	Apl. 1	5½	5½	5½ p.c. Red. Deb.	99—102	...
231,977	Feb. 21	5	5	M.S. Utility 'C' Cons. ...	99—104	...
968,658	,,	4	4	Do. 4 p.c. Cons. Pref.	95—100	...
360,075	Dec. 13	4	4	M.S. Utility 4 p.c. Deb. ...	97—102	...
148,955	,,	5	5	Do. 5 p.c. Deb. ...	113—118	...
675,000	May 9	†6	†6	Montevideo, Ltd.	70—75	...
250,000	Mar. 7	7½	7½	North Middlesex 6 p.c. Con.	145—150	...
396,160	Feb. 7	5	5	Northampton 5 p.c. max. ...	107—112	...
300,000	Apl. 25	†9	†7	Oriental, Ltd.	150—155	...
468,537	June 3	8	8	Plymouth & Stonehouse 5 p.c.	152—157*	...
621,667	Feb. 7	8½	8½	Portsmouth & Gosport Cons.	160—165	...
241,446	,,	5	5	Do. 5 p.c. max. ...	102—107	...
73,350	,,	5	5	Do. 5 p.c. Pref. ...	108—113	...
75,000	Feb. 7	...	4	Do. 4 p.c. Pref. ...	95—100	...
114,000	Feb. 7	5	5	Preston 5 p.c. Pref.	106—109	...
247,966	June 3	4	4	Primitiva 4 p.c. Cons. Deb. ...	97—102*	...
625,959	Jan. 17	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...
15,000	Mar. 21	6	6	San Paulo 6 p.c. Cum. Pref. ...	8¾—9½	...
441,275	Apl. 25	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	20/6—22/6	...
460,810	Mar. 21	-/10⅝	-/10⅝	,, ,, 4½ p.c. Cum. Pref.	19/6—21/6	...
133,201	Feb. 7	8½	5	Shrewsbury 5 p.c. Ord. ...	128—133	...
9,000	June 3	4	‡4	South African Ord.	3¾—4¼*	...
1,371,752	Apl. 25	1/2⅛	1/2⅛	South East'n Gas Cn. Ld. Ord.	21/6—23/6	...
871,636	Mar. 7	-/10⅝	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	20/6—22/6	...
498,818	,,	4	4	Do. 4 p.c. Cum. Pref. ...	18/—20/—	...
450,000	Feb. 7	4	4	Do. 4 p.c. Deb.	100—103	...
150,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—98	...
6,709,895	Feb. 7	6	5	South Met. Ord.	104—107	...
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pf. ...	130—135	...
850,000	,,	4	4	Do. 4 p.c.Irred. Pf. ...	97—100	...
1,895,445	Dec. 13	3	3	Do. 3 p.c. Deb. ...	78½—81½	...
1,000,000	Jan. 17	5	5	Do. 5 p.c. Red. Deb....	109—112	...
1,543,795	Feb. 7	6	6	South Suburban Ord. 5 p.c. ...	118—123	...
512,825	,,	5	5	Do. 5 p.c. Pref....	110—115	...
500,000	,,	4	4	Do. 4 p.c. Pref....	95—100	...
250,000	,,	§18/9	3¾	Do. 3¾ p.c. Red. Pref.	98—101	...
888,587	June 3	5	5	Do. 5 p.c. Deb....	115—120*	...
250,000	,,	4	4	Do. 4 p.c. Deb....	96—101*	...
200,000	Mar. 1	3½	3½	Do. 3½ p.c. Red. Deb.	94—99	...
427,859	Apl. 25	1/2⅛	9⅜	S. Western Gas & Water Ord.	16/6—18/6	...
160,523	,,	-/10⅛	-/10⅛	Do. 4½ p.c. Red. Cum. Pf.	19/—21/—	...
110,000	June 3	4	4	Do. 4 p.c. Red. Deb. ...	95—100*	...
750,541	Feb. 7	5	5½	Southampton Ord. 5 p.c. ...	108—113	...
148,836	June 3	4	4	Do. 4 p.c. Deb.	95—100*	...
350,000	Feb. 7	5½	5½	Swansea 5½ p.c. Red. Pref. ...	108—113	...
94,000	June 3	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100*	...
1,076,490	Feb. 7	6½	6½	Tottenham and District Ord.	126—131	...
409,835	,,	5½	5½	Do. 5½ p.c. Pref....	119—124	...
62,235	,,	5	5	Do. 5 p.c. Pref....	108—113	...
371,850	June 3	4	4	Do. 4 p.c. Deb....	95—100*	...
85,701	Apl. 25	6	6	Tuscan 6 p.c. Red. Deb. ...	95—100	...
888,629	Apl. 4	4	6	U. Kingdom Gas Cor. Ord....	18/6—20/6	...
937,743	May 9	4½	4½	Do. 4½ p.c. 1st Cum. Pref.	19/6—21/6	...
500,000	,,	-/1·15	4	Do. 4 p.c. 1st Red. Cum. Pf.	19/—21/-	...
745,263	June 3	4½	4½	Do. 4½ p.c. 2nd Non-Cum.Pf.	16/—18/-*	...
1,000,000	Mar. 7	3½	3½	Do. 3½ p.c. Red. Deb. ...	96—99	...
373,939	Feb. 7	7	7	Uxbridge, &c., 5 p.c.	133—138	...
133,010	,,	5	5	Do. 5 p.c. Pref. ...	108—113	...
1,371,138	Feb. 7	7	7	Wandsworth Consolidated ...	137—142	...
2,525,768	,,	4	4	Do. 4 p.c. Pref. ...	98—101	...
1,343,964	June 3	5	5	Do. 5 p.c. Deb. ...	115—120*	...
383,745	,,	4	4	Do. 4 p.c. Deb. ...	97—102*	...
558,342	Feb. 7	7	7	Watford and St. Albans Ord.	135—140	...
200,000	,	5	5	Do. 5 p.c. Pref. ...	110—115	...
200,000	,,	5½	5½	Do. 5½ p.c Pref. ...	120—125	...
200,000	June 3	4	4	Do. 4 p.c Red. Deb.	96—101*	...
100,000	,,	3½	3½	Do. 3½ p.c. Red. Deb.	94—99*	...

a.—The quotation is per £1 of stock. * Ex. div. † Paid free o income-tax ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Cont.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations, June 17.	Rise or Fall on Week.
202,152	Mar. 21	5	5	Ascot Ord.	103—108	...
128,182	Dec. 13	5	5	Do. 5 p.c. Pref.	108—113	...
31,035	Mar. 21	...	– 4½	Associated Utilities 4 p.c. Pref.	16/—18/–	...
100,000	Dec. 13	...	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...
17,000	Feb. 21	8	8	Bognor Orig. Ord. 'A' ...	155—165	...
62,210	,,	8	8	Do. New Addl. 'A' ...	155—165	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	155—165	...
37,440	Feb. 7	10	10	Cam. Univ. & Town 10 p.c. max.	190—200	...
125,970	,,	7	7	Do. 7 p.c. max.	135—140	...
39,025	,,	5	5	Do. 5 p.c. max.	97—102	...
96,410	Feb. 7	4½	4½	Cardiff 4½ p.c. Pref.	95—100	...
150,000	Feb. 21	4	4	Croydon 4 p.c. Pref.	98—101	...
130,000	Dec. 13	4	4	Do. 4 p.c. Deb.	97—102	...
65,000	Mar. 7	7½	8½	Eastbourne 'A' 5 p.c. ...	155—160	...
198,000	,,	6	7	Do. 'B' 3½ p.c.	125—130	...
112,312	,,	5	5	Do. 5 p.c. Pref.	107—112	...
130,000	Dec. 13	5	5	Do. 5 p.c. Deb.	113—118	...
24,000	Feb. 21	8½	8½	Great Yarmouth 8½ p.c. max.	43—48	...
59,400	,,	7½	7½	Do. 7½ p.c. max.	33—38	...
51,160	June 3	5½	5½	Do. 5½ p.c. Deb.	120—125*	...
152,600	Feb. 21	8	9	Guildford Cons.	167—172	...
54,055	,,	5	5	Do. 5 p.c. Pref.	108—113	...
68,250	June 3	5	5	Do. 5 p.c. Deb.	107—112*	...
156,600	Feb. 21	7½	7½	Hampton Court Cons. ...	140—150	...
80,000	Feb. 21	4	4	Lea Bridge 4 p.c. Pref. ...	94—99	...
60,000	,,	6	6	Do. 6 p.c. Pref.	123—128	...
94,876	June 3	4	4	Do. 4 p.c. Deb.	95—100*	...
73,620	Mar. 7	8½	8½	Luton Cons. 'A'	160—165	...
107,960	Mar. 21	4	5½	Mid Kent Ord.	8¾—9¾	...
230,940	Feb. 7	10	10	Oxford & District Ord. ...	198—203	...
47,112	,,	5	5	Do. 5 p.c. Pref.	106—111	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	108—113	...
126,193	May 9	7½	7½	Peterborough Ord.	135—145	...
64,990	Mar. 7	6½	7½	Redditch Ord.	120—130	...
166,850	Feb. 7	8	8	Romford Ord.	144—149	...
60,000	,,	4	4	Do. 4 p.c. Pref.	97—100	...
44,000	Mar. 21	5	5	Do. 5 p.c. Deb.	111—116	...
25,570	Feb. 7	5½	5½	Rugby 5½ p.c. Pref.	123—128	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	105—110	...
42,750	June 3	5½	5½	Do. 5½ p.c. Deb.	118—123*	...
110,950	Feb. 21	8	8	Ryde Ord.	140—150	...
270,086	Mar. 21	7	7	Slough Ord.	128—133	...
21,000	Dec. 13	5	5	Do. 5 p.c. Deb.	110—115	...
28,872	May 9	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	19/—21/–	...
28,866	Mar. 7	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	18/6—20/6	...
137,730	Feb. 21	7	7	Southgate & Dist. 7 p.c. max.	135—140	...
62,500	,,	5	5	Do. 5 p.c. Pref.	110—115	...
117,228	Feb. 7	5	7	Swindon Cons.	104—109	...
60,425	June 3	5	5	Do. 5 p.c. Deb.	110—115*	...
64,380	June 3	5	5	Torquay & Paignton 5 p.c. Pref.	107—112*	...
33,858	May 9	–/2·70b	4½	United Kingdom Gas Corpn. 4½ p.c. 1st Cum. Pref. ...	18/—20/–	...
130,000	Feb. 7	5	8	Wakefield Ord.	118—123	...
81,650	,,	5	5	Do. 5 p.c. max.	101—106	...
82,000	Feb. 21	6	6	Weymouth Ord.	105—110	...
98,384	Feb. 7	6	6	Wolverhampton 6 p.c. Pref.	118—123	...
160,000	Dec. 13	5½	5½	Do. 5½ p.c.Rd.Db.	107—112	...
90,000	Dec. 13	5	5	York 5 p.c. Red. Deb. ...	104—109	...
133,640	Feb. 21	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	120—125	...
120,000	,,	5	5	Do. 5 p.c. Pref.	106—111	...
35,000	June 3	5½	5½	Do. 5½ p.c. Deb.	120—125*	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, June 17.	Rise or Fall on Week.
347,756	Feb. 7	5	6	Bath Cons.	120—122	...
1,667,250	Feb. 7	5	5	Bristol, 5 p.c. max.	113—115	...
120,420	June 3	4	4	Do. 1st 4 p.c. Deb. ...	98—101*	...
217,870	,,	4	4	Do. 2nd 4 p.c. Deb. ...	98—101*	...
328,790	,,	5	5	Do. 5 p.c. Deb.	119—122*	+2
274,000	Feb. 21	5	5	Newport (Mon). 5 p.c. max....	99—101	...
13,200	Mar. 21	7	8½	Pontyp'l Gas & W. 10 p.c. 'A'	13—14	...
13,600	,,	5	6	Do. 7 p.c. 'B'	12—12½	...
40,000	,,	5	6	Do. 7 p.c. 'C'	12—12½	...
140,778	Feb. 7	5	5	Weston-super-Mare Cons. ...	110—112	...
64,338	Jan. 3	4	4	Do. 4 p.c. Deb.	94½—96½	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	154—157	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, June 17.	Rise or Fall on Week.
157,150	Feb. 7	5	6½	Chester 5 p.c. Ord.	107—110	...
92,500	Dec. 13	4	4	Do. 4 p.c. Pref.	96—100	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	88—91	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	98—102	...
2,167,410	Feb. 21	6	6	Liverpool 5 p.c. Ord.... ...	124⅝—125⅛	...
245,500	Dec. 13	5	5	Do. 5 p.c. Red. Pref. ...	99—104	...
306,083	Jan. 17	4	4	Do. 4 p.c. Deb.... ...	100—102	...
106,280	Feb. 7	10	10	Preston 'A' 10 p.c.	202—212	...
188,219	,,	7	7	Do. 'B' 7 p.c.	144—154	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, June 17.	Rise or Fall on Week.
122,577	Feb. 21	8	8	Blyth 5 p.c. Ord.	163½—164½	...
732,000	Feb. 21	5	5	Hartlepool G. & W. Cn. & New	110—112	...
2,061,315	Feb. 7	5	5⅝	Newcastle & Gateshead Con.	22/9—23/3a	...
682,856	,,	4	4	Do. 4 p.c. Pref. ...	99½—100½	...
776,706	Jan. 3	3½	3½	Do. 3½ p.c. Deb. ...	89½—90½	...
277,285	May 9	5	5	Do. 5 p.c. Deb. '43 ...	103—105	...
332,351	Feb. 7	6	6	Sunderland 6 p.c. max. ...	137—139	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, June 17.	Rise or Fall on Week.
542,270	Feb. 21	6	9	Derby Con.	135—140	...
55,000	June 3	4	4	Do. 4 p.c. Deb.	100—105	...
20,000	Dec. 13	5	5	Long Eaton 5 p.c. Pref. ...	10—12	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, June 17.	Rise or Fall on Week.
10,000	Feb. 21	10	10	Great Grimsby 'A' Ord. ...	205—215	...
6,500	,,	10	10	Do. 'B' Ord. ...	205—215	...
79,000	,,	10	10	Do. 'C' Ord. ...	195—205	...
1,806,339	Feb. 21	6½	6½	Sheffield Cons.	140—143	...
95,000	Jan. 3	4	4	Do. 4 p.c. Deb.	102—104	...

a The quotation is per £1 of Stock. *b* Actual. * Ex div.

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